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New taxa of Neotropical Geophilomorpha (Chilopoda)

by

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Abstract

A new family (Macronicophilidae) is established for *Macronicophilus* Silvestri, 1909, currently placed in Geophilidae. Seven new species of Neotropical Geophilomorpha are described: *Ityphilus saucius* n.sp. and *I. sensibilis* n.sp. (Ballophilidae), *Hyphydrophilus projectus* n.sp. and *Ribautia onycophaena* n.sp. (Geophilidae), *Macronicophilus abbreviatus* n.sp., *M. unguiseta* n.sp. and *M. venezolanus* n.sp. (Macronicophilidae). The hitherto unknown male of *Schendylops marchantariae* (PEREIRA, MINELLI & BARBIERI, 1995) is described and two species (*Pectiniunguis geayi* (BRÖLEMANN & RIBAUT, 1911) and *Ityphilus calinus* CHAMBERLIN, 1957 are redescribed from the type and new material. A key to the species of *Macronicophilus* is provided.

Keywords: **Neotropics, Amazonia, Chilopoda, Geophilomorpha, Macronicophilidae.**

Resumo

Uma nova familia (Macronicophilidae) é estabelecida para *Macronicophilus* SILVESTRI, 1909, pelo momento colocada em Geophilidae. Sete novas espécies de Geophilomorpha Neotropicais são descritas: *Ityphilus saucius* n.sp. e *I. sensibilis* n.sp. (Ballophilidae), *Hyphydrophilus projectus* n.sp. e *Ribautia onycophaena* n.sp. (Geophilidae), *Macronicophilus abbreviatus* n.sp., *M. unguiseta* n.sp. e *M. venezolanus* n.sp. (Macronicophilidae). É descrito o macho de *Schendylops marchantariae* (PEREIRA, MINELLI & BARBIERI, 1995) até agora desconhecido. Duas espécies (*Pectiniungus geayi* (BRÖLEMANN & RIBAUT, 1911) e *Ityphilus calinus* CHAMBERLIN, 1975 são redescritas baseado no tipo em material novo. Uma chave é providenciada para as espécies de *Macronicophilus*.

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Introduction

New and poorly known taxa are steadily emerging from our ongoing study of Neotropical Geophilomorpha. Seven new species are described in this paper and new or additional descriptions are provided for three more species. Of particular interest is the new material belonging to the genus *Macronicophilus* SILVESTRI, 1909, of which only one species (*M. ortonedae* SILVESTRI, 1909) was known to date. We describe here three more species of this genus and provide a key to their identification. Moreover, a closer study of this genus, in the context of the recent cladistic analysis of geophilomorph suprageneric taxa performed by two of us (FODDAI 1998; FODDAI & MINELLI, in press), has prompted us to place *Macronicophilus* in a family of its own, as formally proposed in a later section of this work.

Material

The bulk of the specimens described in this paper have been collected in Amazonia (Brazil), by Priv.-Doz. Dr. Joachim Adis and coll.; we describe, in addition, a few specimens from Peru (collected by J. Adis, Plön, Germany and Dr. Andrés E. Mármol, Iquitos, Peru) and some others from Venezuela (collected by Dr. Maurizio G. Paoletti, Padua, Italy) (Fig. 1). This paper adds to our knowledge on Neotropical geophilomorphs as recently summarised from a zoogeographical point of view by Pereira et al. (1997b). An extended version including a catalogue of the geophilomorph fauna of the Neotropical region (Mexico included) will be given in a subsequent paper (FODDAI, PEREIRA & MINELLI, 2000).

Holotypes, allotypes and paratypes of the new species have been deposited in the collections of the Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil (INPA), Coll. A. Minelli, Padova, Italy (AM), Coll. J. Adis, Plön, Germany (JA) and Museo de La Plata, La Plata, Rep. Argentina (MLP). Other non type specimens are also housed in the same collections and in the Museo Nacional de Historia Natural, Lima, Peru (MNHL), as indicated thereafter.

The following abbreviations are used throughout the text and in the figure legends: a.a. = antennal article(s); b.l. = body length; d. = dorsal; l. = left; p.l. = pair(s) of legs; r. = right; v. = ventral.

Pending an overall effort to standardize descriptions of geophilomorph species (FODDAI, MINELLI & PEREIRA, in prep.), we take the opportunity given by the following batch of new taxa for reducing to a compact formula the otherwise lengthy description and enumeration of antennal sensilla. The standard arrangement for a.a. II, V, IX and XIII includes three types of sensilla:

type *a* - very thin, not divided apically (e.g., Figs. 7, 8)

type *b* - similar to those of the apex of the terminal article, apically either divided or not (e.g., Figs. 7, 8)

type *c* - bigger, not divided apically and much darker, i.e. ochreous, in colour (e.g., Fig. 8)

On the v. side of a.a. II, V, IX and XIII there are type *a* and type *b* sensilla, restricted to an internal latero-apical area. On the d. side there are, generally, type *a*, type *b* and also type *c* sensilla. Number and distribution of sensilla are mostly species-specific, as detailed in the individual descriptions.

Still in terms of standardization, we start using in this paper the term lappet(s) for those unsegmented appendages of coxosternum or telopodite of the first and second maxillae, usually called palps.

Descriptions and redescriptions

Family Schendylidae

Genus *Pectiniunguis* BOLLMAN, 1889

Diagnosis. - Pleurites of second maxillae not fused with coxosternum; apical claw of second maxillae pectinate on both d. and v. edges. Sterna with pore fields. Last pair of legs with seven podomeres; praetarsus in form of a small hirsute tubercle or replaced by a small spine or altogether absent; coxopleura of the last leg-bearing segment each with two internal coxal organs of composite structure ("heterogeneous coxal glands" sensu BRÖLEMANN & RIBAUT, 1912).

Pectiniunguis geayi (BRÖLEMANN & RIBAUT, 1911) (Figs. 1-37)

Adenoschendyla Geayi BRÖLEMANN & RIBAUT 1911 - Bul. Soc. ent., Paris (1911): 219
Adenoschendyla geayi: BRÖLEMANN & RIBAUT 1912 - Nouv. Arch. Mus. Paris (5)4: 108-109 f. 24-32
Adenoschendyla geayi: CHAMBERLIN 1914 - Bull. Mus. Comp. Zoöl. Harvard 58(3): 153, 201, 204
Adenoschendyla geayi: CHAMBERLIN 1921 - Occ. Papers, Mus. Zool. Univ. Michigan, Ann. Arbor 97: 19, 20
Pectiniunguis geayi: ATTEMS 1929 - Tierreich 52: 81
Pectiniunguis geayi: BÜCHERL 1942b - Mem. Inst. Butantan 15: 351
Pectiniunguis geayi: BÜCHERL 1942a - Mem. Inst. Butantan 15: 205
Pectiniunguis geayi: CRABILL 1959 - J. Wash. Acad. Sci. 49(9): 325, 326
Pectiniunguis geayi: PEREIRA & COSCARÓN 1975(76) - Rev. Soc. ent. Arg. 35(1-4): 68, 72
Pectiniunguis geayi: PEREIRA, MINELLI & FODDAI 1999 - Stud. Neotrop. Fauna Environm. 34: 177

Diagnosis.- A *Pectiniunguis* species with pore fields present along the whole body length. Among the Neotropical species currently included in the genus *Pectiniunguis*, it seems more closely related to *P. gaigei* (CHAMBERLIN, 1921), *P. ducalis* PEREIRA, MINELLI & BARBIERI, 1995 and *P. ascendens* PEREIRA, MINELLI & BARBIERI, 1994. Characters in table 1 differentiate *P. geayi* from these species.

Type material examined.- Holotype ♀ labelled as "*Schendyla* (*Pectiniunguis*) *geayi*," 55 pairs of legs, body length 25 mm. Brazil: Bas-Carsévène, GEAY legit (coll. Muséum National d'Histoire Naturelle, Paris). This specimen is incomplete (forcipulae and first 12 leg-bearing segments are missing). Head and mouth-parts have been mounted in a slide; leg-bearing segments XIII-LV are preserved in alcohol. The two spermathecae full of spermatozoa are visible at the level of segments XLIX-L.

Additional material examined.- Brazil: Amazonas: Rio Tarumã Mirim, capoeira (soil extraction), J. Adis legit: 1 ♂ juv., 49 p.l., b.l. 15 mm, 25.8.1982 (AM); 1 ♂, 51 p.l., b.l. 22 mm, 29.12.1982 (AM); 1 ♂ juv., 49 p.l., b.l. 14 mm, 30.1.1983 (AM). Brazil: Amazonas: Lago Janauari, secondary upland forest (pitfall traps), 29.9.1995, J. Adis et al. leg.: 1 ♂ with mature spermatozoa, 49 p.l., b.l. 22 mm (specimen A, see below) (INPA). Same locality and collectors (soil extraction), 7.3.1996: 1 ♂, 49 p.l., b.l. 21 mm (MLP); 1 ♀ with the two spermathecae full of spermatozoa, 51 p.l., b.l. 31 mm (specimen B, see below); 1 fragmentary ♀ specimen; 2 ♂♂ juv., 49 p.l., b.l. 14 and 15 mm, 2 ♀♀ juv. 51 p.l., b.l. 16 and 17 mm (INPA); 1 juv. (♀?), 49 p.l., b.l. 13 mm; 1 juv. (♀?), 51 p.l., b.l. 12 mm; 1 juv. (sex ?) with 1+1 coxal organs only, 51 p.l., b.l. 10 mm (JA).

Type locality.- Brazil: Bas Carsévène.

Known range.- Brazil: Bas Carsévène; Amazonas: Rio Tarumã Mirim; Lago Janauari.

Redescription

Male (specimen A) - 49 pairs of legs, body length 22 mm, maximum body width 1.0 mm. Colour of preserved specimen in alcohol yellowish with forcipular segment darker (ochreous-orange).

Antennae ca. 2.9 times as long as the cephalic plate, distally slightly attenuate; all articles, the first excepted, longer than wide. Setae on a.a. I to II of various length, few in number; those of remaining articles shorter and more numerous (Figs. 1-2). Terminal a.a. with ca. 25 claviform sensilla on the external border, only 1 on the internal border. Distal end of this a.a. with ca. 4 very small sensilla apparently not divided apically. Number and distribution of sensilla on a.a. II, V, IX and XIII as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II		1			1		3, 4
V	1	1		1	1		5, 6
IX	1	1		1	1	2	7, 8
XIII	1	1		1	1	2	9, 10

Cephalic plate longer than wide (ratio 1.2: 1), shape and chaetotaxy as in Fig. 11.

Clypeus with 1+1 postantennal setae, 7+6 median setae and 1+1 praelabral setae (Fig. 12).

Labrum with 35 teeth, those of the central arc dark, with round tip, the lateral ones less sclerotized, with a relatively long and very sharp medial extension (Fig. 13).

Mandible: dentate lamellae subdivided into three distinct blocks, with 3 teeth each; pectinate lamellae with ca. 20 hyaline teeth (Fig. 14).

First maxillae with well developed lappets on both coxosternum and telopodites (Fig. 16). Coxosternum with 2+2 setae, median projections of coxosternum subtriangular, well developed and provided with 1+1 setae. Article II of the telopodite with 2+3 v. setae and 6+6 d. sensilla (Figs. 15-16).

Second maxillae with 13 setae on the coxosternum, arranged as in Fig. 15. Apical claw of telopodite well developed, bipectinate, d. and v. edges (Fig. 17) with ca. 8 teeth.

Forcipulae: when closed, the telopodites do not extend beyond the anterior margin of the head; basal plate with an irregular transverse median row of 10 large setae and a few additional smaller setae scattered on the posterior half. A small tooth with round tip on the apical medial edge of the trochanteropraefemur of the telopodite; remaining articles without teeth. Calyx of poison gland cylindrical (Fig. 19). Chaetotaxy of coxosternum and telopodites as in Fig. 18.

Legs (last pair excepted) with chaetotaxy (Fig. 20) uniform throughout the body length; claws ventrobasally with one anterior spine and two posterior spines (Fig. 21).

Sterna: pore fields present from second to antepenultimate sternum. All pore fields undivided and subcircular. Form of fields changing along the trunk as in Figs. 22-29. Number of pores on selected sterna: on sternum II, 27 pores; on IV, 51; on IX, 39; on XV, 55; on XXIII, 21; on XXXVII, 10; on XLIII, 16; on XLVII, 25.

Last leg-bearing segment without pleurites at the sides of praetergum. Praesternum not divided along the sagittal plane; shape and chaetotaxy of tergum and sternum as in Figs. 30-31.

Coxopleura slightly protruding at their distal v. ends, setae small and numerous on v. internal margin, the remaining surface with few larger setae. Two compound ("heterogeneous") coxal organs on each coxopleuron (cf. female, Fig. 36). Coxal organs open on the membrane between coxopleuron and sternum, covered by the latter (Fig. 31). Last legs moderately inflated, with seven podomeres, shape and chaetotaxy as in Figs. 30-31. Praetarsus as a very small tubercle with ca. 11 small and very thin apical spines (cf. female, Fig. 37).

Terminal segments: intermediate tergum and sternum with posterior margin convex; first genital sternum with posterior margin medially convex, laterally slightly concave (Figs. 30-31). Gonopods biarticulate, basal article with ca. 9 setae, apical article with ca. 7 setae (Fig. 32), penis dorsally apparently without apical setae (Fig. 33).

Female (specimen B).- 51 pairs of legs, body length 31 mm, maximum body width 1.2 mm.

All features similar to those in the male except for the shape and chaetotaxy of the last leg-bearing segment and terminal segments.

Last leg-bearing segment: form and chaetotaxy of tergum and sternum as in Figs. 34-35. Coxopleura slightly protruding at their distal v. ends, setae small and numerous on v. internal margin, the remaining surface with few setae of various length. Podomeres of terminal legs with shape and chaetotaxy as in Figs. 34-35.

Terminal segments: posterior margin of intermediate tergum and sternum convex; posterior margin of first genital sternum slightly convex (Figs. 34-35). Gonopods uniarticulate (Fig. 35).

Variation.- The number of pairs of legs in the females is 51, 55 and in the males 49, 51, 53. Females with 53 pairs of legs have not been yet collected, but certainly exist in nature.

Remarks. - We have provided a redescription for this species, because BRÖLEMANN & RIBAUT's original description (1912:108-109) lacked many important details and illustrations of the male last leg-bearing segment and terminal segments.

Genus *Schendylops* COOK, 1899

Diagnosis. - Pleurites of second maxillae not fused to the coxosternum; apical claw of second maxillae pectinate on both d. and v. edges. Sterna with pore fields. Last pair of legs with seven podomeres; praetarsus in form of a small hirsute tubercle or replaced by a small spine or altogether absent. Coxopleura of the last leg-bearing segment each with two internal coxal organs of simple structure ("homogeneous coxal glands" sensu BRÖLEMANN & RIBAUT 1912).

Schendylops marchantariae (PEREIRA, MINELLI & BARBIERI, 1995) (Figs. 38-41)

Schendylurus marchantariae PEREIRA, MINELLI & BARBIERI, 1995 - Amazoniana 13 (3/4): 325, 344-345.

Schendylops marchantariae: HOFFMAN & PEREIRA 1997 - Myriapodologica 5(2): 21

New material examined.- Brazil: Amazonas: vicinity of Manaus: Ilha de Curari, Rio Solimões 03°15' S 59°49' W, white-water inundation forest (várzea), BE (arboreal photoeclectors), 16.8.1976, J. Adis legit: ♂ (specimen A described below) with mature spermatozoa visible by transparency inside the body, 53 p.l., b.l. 32 mm (INPA); 1 ♀ with the two spermathecae full of spermatozoa, 55 pl., b.l. 42 mm, BE, 19.02.1976 (MLP), 1 ♀ with the two spermathecae full of spermatozoa, 53 p.l., b.l. 29 mm, BE, 21.7.1976 (MLP), 1 ♂ with mature spermatozoa, 53 p.l., b.l. 23 mm, BE, 3.8.1976 (MLP), 1 ♀ with the two spermathecae full of spermatozoa, 53 p.l., b.l. 39 mm; 1 male, 53 p.l., b.l. 31 mm, BE, 3.8.1976 (AM). 2 ♀♀ with the two spermathecae full of spermatozoa, 53 p.l., b.l. 31 and 33 mm; 1 ♀, 53 p.l., b.l. 29 mm; 1 ♀ with mature spermatozoa, 53 p.l., b.l. 31 mm, BE, 3.8.1976 (JA); 1 ♂, 53 p.l., b.l. 22 mm, BE, 7.7.1976 (INPA); 1 ♂ with mature spermatozoa, 55 p.l., b.l. 25 mm; 2 ♀♀, 53 p.l., b.l. 19 and 25 mm, BE, 21.7.1976 (INPA); 1 ♀, 53 p.l., b.l. 24 mm; 2 fragmentary specimens, BE, 16.8.1976 (INPA). Peru: Iquitos: Rio Nanay, near Morona Cocha, 18.4.1997, J. Adis & A. Marmol leg.: 1 ♂ with mature spermatozoa, 45 p.l., b.l. 27 mm; 3 ♂♂ with mature spermatozoa, 47 p.l., b.l. 25, 27 and 29 mm; 2 ♀♀ with mature ova, 49 p.l., b.l. 25 and 27 mm; 1 ♀ with mature ova, 51 p.l., b.l. 26 mm; 1 ♀ 49 p.l., b.l. 27 mm; 1 ♀ subadult, 47 p.l., b.l. 24 mm; 2 ♀♀ juv., 49 p.l., b.l. 15 and 22 mm; 1 ♂ juv., 47 p.l., b.l. 20 mm (MNHL).

Type locality.- Brazil: Amazonas: Rio Solimões, Ilha de Marchantaria, 59°58'W, 3°15'S, várzea, collected in freshwater sponge on tree trunk.

Known range.- Brazil: Amazonas: Rio Solimões, Ilha de Marchantaria (type locality) and Ilha de Curari (some Km distant from the first); Peru: Iquitos.

Remarks.- This species was described on the basis of the female holotype only.

Description of the male

Specimen A of the above list.- 53 p.l., b.l. 32 mm, maximum body width 1.0 mm.

All features similar to those in the female except for the shape and chaetotaxy of the last leg-bearing segment and terminal segments.

Last leg-bearing segment: form and chaetotaxy of sternum and tergum as in Figs. 38-39. Coxopleura slightly protruding at their distal v. ends, setae small and numerous on distal v. half, the remaining surface with few bigger setae. Podomeres of terminal legs inflated, shape and chaetotaxy as in Figs. 38-39.

Terminal segments: intermediate tergum with posterior margin convex; intermediate sternum with posterior margin concave; first genital sternum with posterior margin medially convex, laterally concave (Figs. 38-39). Gonopods biarticulate, basal article with ca. 21 setae and distal with ca. 13 setae (Fig. 40), dorsal aspect of penis with 1+1 setae (Fig. 41).

Variation.- Brazil specimens of the two sexes have either 53 or 55 pairs of legs, but those from Peru have a lower number of segments, the males having either 45 or 47, females 47, 49 or 51 pairs of legs.

Family Ballophilidae

Genus *Ityphilus* COOK, 1899

Diagnosis.- Antennae conspicuously clavate. Central arc of labrum membranous, without teeth or with minute hair-like structures. Forcipular coxosternum with complete or virtually complete chitinous lines; medial edge of tarsungulum smooth to conspicuously serrate. Ventral pores arranged in transversally elliptical or subcircular fields. Coxopleura of the last leg-bearing segment each with two internal coxal organs of simple structure ("homogeneous coxal glands" sensu BRÖLEMANN & RIBAUT 1912). Last pair of legs with seven podomeres, praetarsus setiform, basally "tubercle-like".

Remarks.- In the following we describe three new species of ballophilids which more or less properly fit into the generic diagnosis for *Ityphilus* as above. However, one of these species, described in the following as *I. sensibilis* n.sp., shows at least one trait in common with the related genus *Ballophilus*, rather than with the other *Ityphilus* species. This trait is the presence of a sulcus along the sagittal plane of the coxosternum of the second maxillae. We have already raised elsewhere (PEREIRA et al., 1997a) similar problems with the discrimination between *Ityphilus* and *Ballophilus*. It is quite possible that future research will suggest merging the two genera into one.

Ityphilus calinus CHAMBERLIN, 1957 (Figs. 42-68)

Ityphilus calinus CHAMBERLIN 1957 - Proc. biol. Soc. Washington 70: 25, 30, Fig. 7

Ityphilus calinus: PEREIRA & MINELLI 1997 - Stud Neotrop. Fauna Environm. (1996) 31: 110

Diagnosis.- *I. calinus* is easily differentiated from the remaining Neotropical species of *Ityphilus* by having a very low number of leg-bearing segments (41 or 43).

Material examined.- Brazil: Amazonas: secondary upland forest (02°34'S, 60°06'W), M. O. de A. Ribeiro leg.: 1 ♀, 43 p.l., b.l. 11 mm (specimen "A"), 07.11.1990 (INPA); 1 ♂, 41 p.l., b.l. 8.5 mm (specimen "B"), 06.12.1990 (INPA); 1 ♀ juv., 43 p.l., b.l. 9 mm, 03.01.1991 (AM); 2 juv. with 1+1 coxal organs only, 43 p.l., b.l. 6 and 7 mm, 09.10.1990 (JA); 1 ♀, 43 p.l., b.l. 11 mm, 09.10.1990 (MLP). Brazil: Amazonas: Reserva Florestal A. Ducke (02°55'S 59°59'W), 27.10.1987, J. Adis et al. leg., 5 juv., all with 1+1 coxal organs only (2 specimens, 41 p.l., b.l. 7 mm; 1 specimen, 41 p.l., b.l. 8 mm; 1 specimen, 43 p.l., b.l. 7 mm; 1 specimen, 43 p.l., b.l. 8 mm) (INPA).

Remarks.- CHAMBERLIN's original description is very poor (many characters of important diagnostic value are not specified) and doesn't include figures. We provisionally identify our specimens as *I. calinus* because at present it is not possible to differentiate them from this species on the base of CHAMBERLIN's

description. It is possible that our specimens in reality belong to a new species, but that could be only decided after an examination of the type specimen of *I. calinus*.

Type locality.- Colombia: Cali.

Known range.- Colombia: Cali; Brazil: Amazonas.

Redescription

Based on the female specimen "A" as above.- 43 pairs of legs, body length 11 mm, maximum body width 0.4 mm. Colour (of preserved specimen in alcohol) pale ochre.

Antennae ca. 1.7 times as long as the cephalic plate, curved at middle and distally conspicuously clavate. The apical club extends over a.a. VII-VIII to XIV of which a.a. VII-VIII are transitional, being narrow at the base and strongly widening distad. Articles, the last excepted, all wider than long. Ventral chaetotaxy: setae on a.a. I-VIII of different lengths, few in number, those of remaining articles much shorter and very numerous (Fig. 42); d. chaetotaxy: setae on a.a. I-VIII similar to those on v. side, on a.a. IX-XIV larger and much less numerous than those on v. side. Terminal a.a. with ca. 10 claviform sensilla on the external border and ca. 4 on the internal border. Distal end of this a.a. with ca. 3 very small hyaline sensilla apparently not split apically. Number and distribution of sensilla on a.a. II, V, IX and XIII are as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II		1			1		43
V	1	1		1	1		44
IX	1	1		1	2	2	
XIII	1	1		1	2	2	45

Cephalic plate slightly wider than long (ratio 1.1: 1), shape and chaetotaxy as in Fig. 46.

Clypeus with 7+5 setae distributed as in Fig. 47.

Labrum without teeth on the central arc, lateral pieces with 3-4 very small and not well-defined teeth. These teeth have rounded tip and are not sclerotized (Fig. 48).

Mandible: dentate lamella not subdivided in blocks, with 10 teeth (Fig. 49); pectinate lamella with ca. 19 hyaline teeth.

First maxillae without lappets on coxosternum, telopodites with lappets (Fig. 51). Coxosternum without setae; median projections of coxosternum subtriangular, well developed, with 1+1 setae (Fig. 50). Article II of telopodite with 1+1 v. setae and 3+3 d. sensilla (Figs. 50-51).

Second maxillae with 4+4 setae on coxosternum arranged as in Fig. 50. Apical claw of telopodite well developed, bipectinate; d. and v. edges with ca. 7-8 teeth.

Forcipulae: when closed, telopodites do not extend beyond the anterior margin of the head; basal plate with two irregular transverse rows of ca. 11 large setae on the middle. Coxosternum with complete chitinous lines. All articles of telopodites lack teeth. Proximal half of the internal edge of the ungulum serrate (Figs. 52-53). Calyx of poison gland as in Fig. 53; chaetotaxy of coxosternum and telopodites as in Fig. 52.

Legs (last pair excepted) with chaetotaxy uniform throughout the body length (Fig. 54). Claws ventrobasally with three small hyaline spines, their arrangement and relative size as in Fig. 55.

Sterna: pore fields present from the second to the penultimate sternum, all fields undivided and on a raised subcircular prominence. Form and relative size of fields changing along the trunk as in Figs. 56-63. Number of pores on selected sterna: on sternum II, 12 pores; on III, 23; on V, 21; on VIII, 30; on XVII, 24; on XXVII, 9; on XXXV, 9; on XLII, 4.

Last leg-bearing segment with pleurites at the sides of praetergum. Praesternum apparently divided along the sagittal plane; form and chaetotaxy of tergum and sternum as in Figs. 64-65. Coxopleura with numerous setae on the v. side, the remaining surface with few setae. Two single ("homogeneous") coxal

organs on each coxopleuron opening on the membrane between coxopleuron and sternum (Fig. 66). Last legs with seven podomeres; these strongly thickened, subconically narrowing from base to distal end, form and chaetotaxy as in Figs. 64-65. Praetarsus as a long, straight, setiform structure, accompanied by a very small dorsal spine.

Terminal segments: intermediate tergum with posterior margin strongly convex, intermediate sternum with posterior margin more moderately convex; first genital sternum medially concave. Gonopods uniarticulate (Fig. 65).

Male.- Description based on specimen "B" as above - 41 pairs of legs, body length 8.5 mm, maximum body width 0.35 mm. All features similar to those in the female except for the shape and chaetotaxy of the last leg-bearing segment and terminal segments.

Last leg-bearing segment: form and chaetotaxy of tergum and sternum as in Figs. 67-68. Coxopleura with numerous setae on v. side, the remaining surface with few setae (Figs. 67-68). Podomeres of terminal legs inflated, shape and chaetotaxy as in Figs. 67-68.

Terminal segments: intermediate tergum with posterior margin convex; intermediate sternum and first genital sternum with posterior margin concave. Gonopods ventrally inarticulate, dorsally inconspicuously articulated, each gonopod with ca. 3 setae (Fig 68); penis dorsally without apical setae.

Variation.- CHAMBERLIN (1957) gives 43 pairs of legs for the ♂ holotype. In the present additional material, the adult male has 41 p.l. and the females 43.

Ityphilus saucius n.sp. (Figs. 69-89)

Diagnosis.- This new species seems to be closely related to *I. demoraisi* PEREIRA, MINELLI & BARBIERI, 1995, *I. perrieri* (BRÖLEMANN, 1909) and *I. lilacinus* COOK, 1899, but can be differentiated from these species and from all the other Neotropical *Ityphilus* species by the shape of the anterior border of the forcipular coxosternum which is very deep, as shown in Fig. 77. It is also similar to *Cerethmus naiquatanus* CHAMBERLIN, 1941, from which it also differs, among other characters, by the shape of the anterior border of the forcipular coxosternum.

Type material.- Holotype ♀, 67 (?) p.l., b.l. 22 mm. Brazil: Amazonas: 02°34'S 60°06'W, capoeira, burned secondary upland forest, 01.2.1991, M.O. de A. Riveiro leg. (INPA).

Remark.- This specimen is incomplete. The body is fragmented in three parts and at least one leg-bearing segment of the middle part of the body is missing.

Description

Female holotype.- 67 (?) pairs of legs (see Remark), body length 22 mm at least, maximum body width 0.7 mm. Colour of preserved specimen pale ochre.

Antennae ca. 3 times as long as the cephalic plate, distally moderately clavate. The apical club extends over a.a. IX to XIV. Articles, the last excepted, all wider than long. Ventral chaetotaxy: setae on a.a. I-VIII of different lengths and few in number, those of remaining articles much shorter and very numerous (Fig. 69); d. chaetotaxy: setae on a.a. I-VIII similar to those on the v. side, setae on a.a. IX-XIV larger and much less numerous than those on the v. side. Terminal a.a. with ca. 9 claviform sensilla on the external and internal borders (Fig. 70). Distal end of this a.a. with ca. 13 very small hyaline sensilla apparently not split apically (Fig. 70). Number and distribution of sensilla on a.a. II, V, IX and XIII are as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II		1		1	1		
V	1	1		1	1		71
IX	1	1		1	3	5	
XIII	1	1		1	2	5	72

Cephalic plate slightly wider than long (ratio 1.15: 1), shape and chaetotaxy as in Fig. 73.

Clypeus with 4 setae near the anterior margin of the head and 2 setae on the middle; praelabral setae absent (Fig. 74).

Labrum without teeth on the central arc, lateral pieces with 2+2 very small teeth (Fig. 75).

Mandible: dentate lamella not subdivided into blocks, with 14 teeth; pectinate lamella with ca. 32 hyaline teeth.

First maxillae with lappets on both coxosternum and telopodites, those of coxosternum rudimentary. Coxosternum without setae, median projections well developed, subtriangular and provided with 1+1 setae. Article II of telopodite with 1+1 v. setae (Fig. 76) and ca. 2+2 d. sensilla.

Second maxillae with 5+5 setae on coxosternum arranged as in Fig. 76. Apical claw of telopodite well developed, bipectinate, the d. edge with ca. 15 teeth, the v. edge with ca. 8 teeth.

Forcipulae: when closed, the telopodites do not extend beyond the anterior margin of the head. Basal plate with ca. 37 setae dispersed on almost the whole surface. Coxosternum with complete chitinous lines. All articles of telopodites lack teeth. Proximal half of the internal edge of the ungulum serrate (Figs. 77-78). Calyx of poison gland short and subcylindrical (Fig. 78); chaetotaxy of coxosternum and telopodites as in Fig. 77.

Legs (last pair excepted) with chaetotaxy uniform throughout the body length (Fig. 79). Claws ventrobasally with two spines: one anterior, very small, and one posterior, much larger (Fig. 80).

Sterna: pore fields present from the second to the antepenultimate sternum (sternum II with only one pore and associated gland). All fields undivided, placed on a subcircular-subovoidal prominence. Form and relative size of fields changing along the trunk as in Figs. 81-86. Number of pores on selected sterna: on sternum II, 1 pore; on III, 11; on V, 25; on XIV, 56; on the sternum preceding the antepenultimate, 13; on the antepenultimate, 4.

Last leg-bearing segment with pleurites at the sides of praetergum. Praesternum apparently divided along the sagittal plane; form and chaetotaxy of tergum and sternum as in Figs. 87-88. Coxopleura with numerous setae on the v. side, the remaining surface with few setae. Two single ("homogeneous") coxal organs on each coxopleuron opening on the membrane between coxopleuron and sternum (Fig. 89). Last legs with seven podomeres, strongly thickened, subconically narrowing from the proximal to the distal end, form and chaetotaxy as in Figs. 87-88. Praetarsus as a long, straight, setiform structure, accompanied by a very small spine.

Terminal segments: posterior margin of the intermediate tergum strongly convex, posterior margin of the intermediate sternum straight to slightly concave; first genital sternum slightly concave. Gonopods uniarticulate (Fig. 88).

Male.- Unknown.

Etymology.- The name of this species refers to the incomplete trunk of the holotype (latin: *saucius*, wounded).

Ityphilus sensibilis n.sp. (Figs. 90-112)

Diagnosis.- The following combination of characters differentiate this species from all other Neotropical species currently assigned to *Ityphilus* (see above): forcipular coxosternum with complete subcondylic chitinous lines; coxosternum of the second maxillae with a sulcus along the sagittal plane; internal side of the first antennal article with strong, stout dark setae; internal side of forcipular ungulum completely serrate.

Type material.- Holotype ♀, 61 p.l., b.l. 28 mm. Brazil: Amazonas: 02°34'S 60°06'W, capoeira, burned secondary upland forest, 1.2.1991, M.O. de A. Ribeiro leg. (INPA).

Description

Female holotype.- 61 pairs of legs, body length 28 mm, maximum body width 0.8 mm. Colour of preserved specimen ochreous.

Antennae ca. 3.3 times as long as the cephalic plate, distally conspicuously clavate. The apical club extends over a.a. VIII to XIV of which a.a. VIII is transitional, being narrow at the base and slightly widening distad. Ventral chaetotaxy: setae on a.a. I to VII-VIII of different lengths and few in number, those of remaining articles much shorter and very numerous; d. chaetotaxy: setae on a.a. I to VII-VIII similar to those on v. side, setae on remaining articles larger and much less numerous than those on v. side. Terminal a.a. with ca. 22 claviform sensilla on the external border and ca. 13 on the internal border. Distal end of this a.a. with ca. 9 very small hyaline specialized sensilla apparently not split apically (Fig. 91). A.a. I with strong, stout dark setae on the internal side (Fig. 92-93). Number and distribution of sensilla on a.a. II, V, IX and XIII are as follows:

	ventral			dorsal		
	a	*b*	*c*	*a*	*b*	*c*
II		1		1		
V	1	1		1	1	8
IX	1	1		1	1	12
XIII	1	1		1	1	5

Cephalic plate nearly as long as wide, shape and chaetotaxy as in Fig. 92.

Clypeus with 5 setae near the anterior margin of the head; praelabral setae absent (Fig. 93).

Labrum without teeth on the central arc, lateral pieces with 3+3 teeth (shape as in Fig. 94).

Mandible: dentate lamella not subdivided into blocks, with 10 teeth (Fig. 95); pectinate lamella with ca. 22 hyaline teeth.

First maxillae with lappets on both coxosternum and telopodite, those of coxosternum rudimentary (Fig. 97). Coxosternum without setae, median projections of coxosternum well developed, subtriangular and provided with 1+1 setae. Article II of telopodite with 1+1 v. setae and ca. 1+1 d. sensilla (Figs. 96-97).

Second maxillae with 4+4 setae on coxosternum arranged as in Fig. 97 and a sulcus along the sagittal plane. Apical claw of telopodite well developed, bipectinate; d. edge with ca. 16 teeth (Fig. 98), v. edge with ca. 9 teeth.

Forcipulae: when closed, telopodites do not extend beyond the anterior margin of the head. Basal plate with ca. 20 setae dispersed on almost the whole surface. Coxosternum with complete chitinous lines. All articles of telopodites lack teeth. Tarsungulum basally with a small and blunt internal projection, which is very poorly pigmented. Internal edge of ungulum completely serrate, proximal third of peculiar shape, as in Figs. 99-100. Calyx of poison gland short and subcylindrical (Fig. 100); chaetotaxy of coxosternum and telopodites as in Fig. 99.

Chaetotaxy of legs (last pair excepted) uniform throughout the body length (Fig. 101). Claws ventrobasally with two spines: one anterior, very small, and one posterior, much larger (Fig. 102).

Sterna: pore fields present from the third to the penultimate sternum, all fields undivided and placed on a subcircular-subovoidal raised prominence. Form and relative size of fields changing along the trunk as in Figs. 103-110. Number of pores on selected sterna: on sternum III, 22 pores; on X, 82; on XVII, 123; on XXIII, 129; on XXXVIII, 60; on LIV, 30; on LVI, 26; on LX, 7.

Last leg-bearing segment with pleurites at the sides of praetergum. Praesternum apparently divided along the sagittal plane; form and chaetotaxy of tergum and sternum as in Figs. 111-112. Coxoplcura with numerous setae distributed as in Figs. 111-112. Two single ("homogeneous") coxal organs on each coxopleuron opening on the membrane between coxopleuron and sternum (Fig. 112). Last legs with seven podomeres, strongly thickened, subconically narrowing from the proximal to the distal end, form and chaetotaxy as in Figs. 111-112. Praetarsus as a long, straight, setiform structure, accompanied by a very small spine.

Terminal segments: posterior margin of the intermediate tergum strongly convex, posterior margin of the intermediate sternum and first genital sternum slightly concave. Gonopods uniarticulate (Fig. 112).

Male.- Unknown.

Remarks.- The Fig. 90 represents a ventro latero-external view of the left antenna. In addition, the articles are a little collapsed (specially a.a. VIII-XIV), for this reason it is not possible to appreciate in this figure that the antennae are truly clavate.

Etymology.- The name of this species refers to the presence of many strong, stout dark tuberculate setae on the internal side of the first antennal article.

Family Geophilidae

Genus *Hyphydrophilus* PEREIRA, MINELLI & BARBIERI, 1994

Diagnosis.- First maxillae without coxosternal lappets, those of telopodites present but rudimentary; second maxillae with coxosternites separated by a non-sclerotized isthmus, antero-internal corners of coxosternum without processes, prominent distally convergent ridges (statuminia *sensu* CRABILL, 1960), first and second articles of telopodites with or without a distoectal process. Forcipulae: pleurocoxosternal sutures as in Fig. 124, chitinous lines nearly complete but not very evident; ventral pore fields present; each coxopleuron with two large "homogeneous" coxal organs (similar to those of *Schendylops*). Last pair of legs with two tarsal articles; praetarsus claw-like, well developed.

Remarks.- The generic assignment of *H. projectus* n.sp. to *Hyphydrophilus* requires some change in the diagnosis of the genus, as to the presence of a distoectal process on first and second articles of telopodites of second maxillae.

Hyphydrophilus projectus n.sp. (Figs. 113-140)

Diagnosis.- The presence of a distoectal process on first and second articles of telopodites of the second maxillae as well as the other characters in table 2 differentiate *H. projectus* n.sp. from *H. adisi* PEREIRA, MINELLI & BARBIERI, 1994 which is the type species of the genus and the only other species until now included in it.

Type material.- All specimens from Brazil: Amazonas: 02°30'S 60°10'W (terra firme, campinarana white-sand forest), J. Adis et al. leg., 17.8.1988: holotype ♂, 37 p.l., b.l. 8 mm; paratype A (♂), 39 p.l., b.l. 9 mm; paratype B (♀), 37 p.l., b.l. 9 mm; paratype C (♂), 37 p.l., b.l. 8 mm; paratype D (♂), 37 p.l., b.l. 9 mm. Ibid., 29.3.1988: allotype ♀, 37 p.l., b.l. 8 mm; paratype E (♂), 37 p.l., b.l. 8 mm; paratype F (♀), 37 p.l., b.l. 8 mm; paratype G (♂), 37 p.l., b.l. 8 mm; paratype H (♀), 37 p.l., b.l. 8 mm; paratype I (♂), 37 p.l., b.l. 8 mm; paratype J (♂), 37 p.l., b.l. 8 mm; paratype K (♂), 37 p.l., b.l. 7.5 mm; paratype L (♂), 37 p.l., b.l. 8 mm; paratype M (♂), 37 p.l., b.l. 8 mm; paratype N (♀), 37 p.l., b.l. 8.5 mm.

Depository of types: INPA (holotype, allotype, paratypes A, B, C); AM (paratypes D, E, F, G); JA (paratypes H, I, J); MLP (paratypes K, L, M, N).

Other material examined.- Same locality and collector as the type series, 17.8.1988: 1 juv. (sex?) with 1+1 coxal organs only, 37 p.l., b.l. 5 mm; 3 ♂♂ juv., 37 p.l., b.l. 7 mm; 1 ♀ juv., 37 p.l., b.l. 7 mm (INPA). Ibid., 23.3.1988: 1 ♂ juv., 37 p.l., b.l. 5 mm; 1 juv. (sex?), with 1+1 coxal organs only, 37 p.l., b.l. 5 mm; 1 ♀ (juv.?), 37 p.l., b.l. 5 mm; 1 juv. (♀?), 37 p.l., b.l. 5 mm (INPA). Brazil: Amazonas: Manaus, INPA (terra firme, unburned secondary upland forest), 03°08'S 60°01'W, 25.9.1985, J. Adis et al. leg., 1 ♂ juv., 39 p.l., b.l. 6 mm; 1 ♂ juv., 37 p.l., b.l. 7 mm; 1 ♂, 37 p.l., b.l. 10 mm; 2 adult fragmentary specimens; 1 juv. fragmentary specimen (AM). Brazil: Amazonas: Manaus, INPA, (terra firme, secondary upland forest), 03°08'S 60°01'W, 24.4.1986, J. Adis et al. leg., 2 ♀♀, 37 p.l., b.l. 10 mm; 1 ♀, 37 p.l., b.l. 8 mm; 2 ♂♂, 37 p.l., b.l. 8 and 9 mm; 1 ♂ (adult?), 37 p.l., b.l. 7 mm; 2 ♀♀ juv., 37 p.l., b.l. 7 and 7.5 mm; 5 ♂♂ juv., 37 p.l., b.l. 6.5, 7, 7, 7 and 7.5 mm; 1 juv. (sex?), 37 p.l., b.l. 7 mm; 3 juv. (sex?), (with 1+1 coxal organs only), 37 p.l., b.l. 5, 5 and 6 mm; 4 fragmentary specimens (JA). Brazil:

Amazonas: 02°34'S 60°06'W, capoeira, burned secondary upland forest, M.O. de A. Ribeiro leg., 3.7.1990: 1 ♀ juv., 41 p.l., b.l. 7 mm, 1.8.1990: 1 ♀, 41 p.l., b.l. 10 mm. 3.1.1991: 2 ♀♀, 41 p.l., b.l. 8.5 and 9 mm; 1 ♂ juv., 41 p.l., b.l. 6 mm (MLP).

Description

Male holotype.- 37 pairs of legs, body length 8 mm, maximum body width 0.3 mm. Colour (of preserved specimen in alcohol) yellowish with forcipular segment darker (pale ochreous).

Antennae ca. 2.4 times longer than the cephalic plate, distally slightly attenuate, all articles longer than wide. Setae on a.a. I-VII of different lengths and few in number; those of remaining a.a. progressively shorter and more numerous towards the tip of the appendage (Fig. 113). Terminal a.a. with ca. 5 claviform sensilla on the external border and ca. 3 on the internal border. Distal end of this a.a. with ca. 4 very small sensilla with two very small apical branches.

Dorsal and ventral surface of a.a. II, V, IX and XIII with two types of sensilla: *a* and *b*. Type *a* are very thin and not divided apically, type *b* are thicker than type *a*, with two diminutive apical branches and pale in colour (Fig. 114: *a*, *b*).

Number and distribution of sensilla on a.a. II, V, IX and XIII as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II		1			1		
V	1	1		1	1		114, 115
IX	1	1		1	1		
XIII	1	1		1	1		

Cephalic plate nearly rectangular but sides curved, distinctly longer than wide (ratio 1.25: 1), shape and chaetotaxy as in Fig. 116.

Clypeus with a group of 4 anteromedial setae, two of these located on the clypeal area, remaining clypeal surface without setae (Fig. 117). Clypeal area very small, with very densely reticulated surface (Fig. 118).

Labrum: mid-piece well developed and sclerotized, with 10 relatively short and sharply pointed teeth in the middle and 2+2 longer teeth at the sides. Side-pieces with 4+4 long hyaline filaments on the internal half and ca. 5+5 very short hyaline teeth on the external half (Fig. 119).

Mandible: pectinate lamella with ca. 13 hyaline teeth, shape as in Fig. 120.

First maxillae without lappets on coxosternum, telopodites with a very small lappet (Fig. 122). Coxosternum without setae; median projections of coxosternum subtriangular, well developed, provided with 3+3 setae. Article II of telopodite with 2+2 v. setae and 1+1 d. sensilla (Figs. 121-122).

Second maxillae: coxites with 4+4 setae, medially joined through a non-areolate isthmus only (Fig. 121). First and second articles of telopodites with distoectal process (Figs. 121, 123); apical claw as long as the third article. Chaetotaxy of telopodites as in Figs. 121, 123.

Forcipulae: when closed, the telopodites reach the level of the anterior margin of the head or slightly project beyond. Basal plate with an irregular transverse median row of 8 large setae and a few additional smaller ones. Coxosternum with almost complete chitinous lines. Telopodites: trochanteropraefemur with a small unpigmented apical projection. Tarsungulum with a conspicuous, deeply pigmented basal denticle. Calyx of poison gland as in Figs. 125-126; chaetotaxy of coxosternum and telopodites as in Fig. 124.

Legs (last pair excepted) with chaetotaxy (Fig. 127) uniform throughout the body length. Claws with one anterior and one posterior ventrobasal spine (Fig. 128).

Sterna: pore fields present from the first to the penultimate sternum. All fields undivided, changing along the trunk as in Figs. 129-136. Number of pores on selected sterna: on sternum I, 4 pores; on II, 5; on XIV, 7; on XV, 5; on XXX, 2; on XXXIV, 4; on XXXV, 2; on XXXVI, 4.

Last leg-bearing segment without pleurites at the sides of praetergum. Praesternum not divided along

the sagittal plane; form and chaetotaxy of tergum and sternum as in Figs. 137-138. Coxopleura slightly protruding at the distal v. ends, setae numerous on distal internal edge, the remaining surface with few setae. Two single ("homogeneous") coxal organs on each coxopleuron, opening near the membrane between coxopleuron and sternum (Fig. 138). Last legs with seven podomeres, form and chaetotaxy as in Figs. 137-138. Praetarsus unguiform, relatively smaller than those of the preceding legs.

Terminal segments: intermediate tergum with posterior margin convex (Fig. 137), intermediate sternum with posterior margin concave. First genital sternum as in Fig. 138. Gonopods apparently inarticulate, with ca. 6-7 setae each; penis with 2+3 d. apical setae. Anal organs absent (Fig. 138).

Female allotype.- 37 pairs of legs, body length 8 mm, maximum body width 0.4 mm.

All features similar to those in the male except for the shape and hairiness of the last leg-bearing segment and terminal segments.

Last leg-bearing segment: form and chaetotaxy of tergum and sternum as in Figs. 139-140. Coxopleura slightly protruding at the distal v. ends, chaetotaxy as in Figs. 139-140. Podomeres of terminal legs moderately inflated, shape and chaetotaxy as in Figs. 139-140.

Terminal segments: posterior margin of the intermediate tergum convex, intermediate sternum not visible (covered by the sternum of the last leg-bearing segment?), posterior border of the first genital sternum medially convex, laterally concave; gonopods uniarticulate (Fig. 140).

Variation.- In our series males have 37, 39 or 41 pairs of legs, females 37 or 41. Females with 39 pairs of legs have not been collected but should exist in the nature. No significant variation in other characters.

Remarks.- Most adult specimens examined were reproductive, the males being full of mature spermatozoa, the females having mature ova and the two spermathecae with many spermatozoa.

Etymology.- The name of this species refers to the presence of a distoectal process in the first and second articles of telopodites of second maxillae.

Genus *Ribautia* BRÖLEMANN, 1909

Diagnosis.- Coxosterna of second maxillae united by a small bridge only; antero-internal corners of coxosternum with a more or less developed process. Forcipulae: pleurocoxosternal sutures extending obliquely to the outer margin; chitinous lines present. Coxopleura of the last leg-bearing segment with numerous coxal organs, opening either individually or in 1-3 clusters on each coxopleuron. Praetarsus of last legs claw-like or tubercle-like.

Remark.- We disregard here the two subgenera currently recognized in *Ribautia* BRÖLEMANN, 1909: *Ribautia* BRÖLEMANN, 1909 s.str., with coxal organs opening independently on the coxopleura, and *Schizoribautia* BRÖLEMANN, 1912, with coxal organs grouped in 1 to 3 clusters. An undescribed species we have currently under study will provide a reason for merging the two nominal taxa into one (PEREIRA et al., in prep.).

Ribautia onycophaena n.sp. (Figs. 141-167)

Diagnosis.- A species of *Ribautia* with coxal organs opening independently on the coxopleura and last leg praetarsus unguiform. Of the Neotropical species in the same genus, this new species seems to be more closely related to *R. ducalis* PEREIRA, MINELLI & BARBIERI, 1995, *R. rossi* CHAMBERLIN, 1957 and *R. tropica* (BRÖLEMANN, 1898). These four taxa can be differentiated by the characters given in Table 3.

For diagnostic characters of the other Neotropical species of *Ribautia* with coxal organs opening independently on the coxopleura see PEREIRA, MINELLI & FODDAI, 1997: 13.

Type material.- All specimens from Brazil: Amazonas: 02°34'S 60°06'W: capoeira (secondary upland forest), M. O. de A. Ribeiro leg., 7.11.1990: holotype ♂, 39 p.l., b.l. 12 mm; ibid., 1.8.1990: allotype ♀,

41 p.l., b.l. 10 mm; paratype A (♀), 41 p.l., b.l. 13 mm; paratype B (♂), 39 p.l., b.l. 10 mm; ibid., 9.10.1990: paratype C (♂), 39 p.l., b.l. 10 mm; paratype D (♀), 41 p.l., b.l. 11 mm; ibid., 7.11.1990: paratype E (♂), 39 p.l., b.l. 8 mm; paratype F (♂), 39 p.l., b.l. 9.5 mm; ibid., 01.2.1991: paratype G (♀), 41 p.l., b.l. 10 mm.

Depository of types: INPA (holotype, allotype); AM (paratypes A, B); JA (paratypes C, D); MLP (paratypes E, F, G).

Other material examined.- All specimens from the same locality and collector as the type series, 1.2.1991: 4 juv. (with 1+1 coxal organs only), 41 p.l., b.l. 4, 4.5, 4.5, 5 mm.

Description

Male holotype.- 39 pairs of legs, body length 12 mm, maximum body width 0.40 mm. Colour (of preserved specimen in alcohol) pale yellowish with forcipular segment pale ochre.

Antennae ca. 2.8 times longer than the cephalic plate, distally very slightly attenuate. Setae on a.a. I to VI of various length, few in number; those of remaining articles progressively shorter and more numerous towards the tip of the appendage (Fig. 141). Terminal a.a. with ca. 10 claviform sensilla on the external border and ca. 6 on the internal border (Fig. 142). Distal end of this a.a. with ca. 5 very small sensilla, apparently not split apically (Fig. 142). Number and distribution of sensilla on a.a. II, V, IX and XIII as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II		1		1	1		
V	1	1		1	1		
IX	1	1		1	2		143, 144
XIII	1	1		1	2		

Cephalic plate nearly rectangular but sides curved, distinctly longer than wide (ratio 1.5: 1), shape and chaetotaxy as in Fig. 145.

Clypeus with 1 pair of anterior setae located on the clypeal area; 2+2 antero-lateral setae and 2 more posterior setae in the middle (Fig. 146). Surface of clypeal area very densely reticulate (Fig. 147).

Labrum: mid-piece well developed and sclerotized, with 8 relatively short and sharply pointed teeth. Side-pieces with 6+6 long hyaline filaments on the internal half and 3+3 small sharply pointed hyaline teeth on the external half (Fig. 148).

Mandible: pectinate lamella with ca. 12 hyaline teeth (Fig. 149).

First maxillae without lappets on coxosternum, telopodites with rudimentary lappets (Fig. 151). Coxosternum without setae; median projections of coxosternum subtriangular, well developed and provided with 3+3 setae. Article II of telopodite with 2+2 v. setae and 1+1 d. sensilla (Figs. 150-151).

Second maxillae: coxites with 5+5 setae, medially joined through a non-areolate membranous isthmus only (Fig. 150). Apical claw of telopodite well developed, curved internally at the tip. Chaetotaxy of coxosternum and telopodites as in Fig. 150.

Forcipulae: when closed, the telopodites reach the level of the anterior margin of the head or slightly project beyond. Basal plate with an irregular transverse row of 6 large setae on the middle and a very few additional smaller setae dispersed on the remaining surface. Coxosternum with incomplete chitinous lines. Telopodites: trochanteropraefemur apically with a small unpigmented protuberance. Tarsungulum with a poorly pigmented basal denticle with rounded tip; d. and v. edges of the ungular blade as in Figs. 152-153. Calyx of poison gland as in Fig. 153; chaetotaxy of coxosternum and telopodites as in Fig. 152.

Chaetotaxy of the legs (last pair excepted) uniform throughout the body length (Fig. 154). Claws with one anterior and one posterior ventrobasal spine (Fig. 155).

Sterna: pore fields present from the second to the penultimate sternum. Fields undivided on sterna II-XIV and XXXIV-XXXVIII, but divided in two subsymmetrical areas on sterna XV-XXXIII. Form of fields

changing along the trunk as in Figs. 156-161. Number of pores on selected sterna: on sternum II, 17 pores; on VI, 22; on XIII, 17; on XIV, 7+7; on XXXIII, 6+5; on XXXVIII, 19.

Last leg-bearing segment without pleurites at the sides of praetergum. Praesternum divided along the sagittal plane; form and chaetotaxy of tergum and sternum as in Figs. 162-163. Coxopleura slightly protruding at their distal v. ends, setae numerous on the distal internal edge, the remaining surface with few setae. Two single ("homogeneous") coxal organs on each coxopleuron, opening near the membrane between coxopleuron and sternum (Fig. 163). Last legs with seven podomeres, form and chaetotaxy as in Figs. 162-163. Praetarsus unguiform, relatively smaller than those of the preceding legs.

Terminal segments: intermediate tergum with posterior margin convex, intermediate sternum with posterior margin concave. First genital sternum with posterior margin convex. Gonopods biarticulate, basal and apical articles with ca. 5 setae (Fig. 164); penis with 3+3 d. apical setae (Fig. 165). Anal organs present.

Female allotype.- 39 pairs of legs, body length 12 mm, maximum body width 0.35 mm. All features similar to those in the male except for the shape and hairiness of the last leg-bearing segment and terminal segments.

Last leg-bearing segment: form and chaetotaxy of tergum and sternum as in Figs. 166-167. Coxopleura slightly protruding at the distal v. ends, setae small and numerous on the distal internal edge, the remaining surface with few larger setae. Three single coxal organs on each coxopleuron (Fig. 167). Shape and chaetotaxy of the podomeres of terminal legs as in Figs. 166-167.

Terminal segments: shape and chaetotaxy as in Figs. 166- 167.

Variation.- In our small series all adult males have 39 pairs of legs, all adult females 41. All males have 2+2, all females 3+3 coxal organs. With regard to the small size of this series we cannot decide whether this difference represents an unusual case of sexual dimorphism, or not. All specimens mentioned in "type material" are fully adult: males are full of spermatozoa and females have mature ova and the two spermathecae full of spermatozoa.

No significant variation was detected in other characters.

Etymology.- The name (from the Greek onyx, onychos, claw, and phaino, to appear) refers to the well developed praetarsus at the last legs.

Family Macronicophilidae n. fam.

A new family Macronicophilidae is established here for *Macronicophilus* Silvestri, 1909 (type genus), currently in Geophilidae.

Diagnosis. - Telopodites of second maxillae provided with 4 articles, the terminal one without apical claw; labrum with a double row of teeth. Mandible stocky, its lamella provided with relatively short and subtriangular teeth.

Remark. - Introducing the new genus *Macronicophilus*, SILVESTRI (1909) placed it in the small but catch-all family Gonibregmatidae. In the same year, BRÖLEMANN (1909) isolated it, within Geophilidae, in a subfamily Himantosominae, together with *Geophagus* Attems, 1897 and *Himantosoma* Pocock, 1891, all of them previously in Gonibregmatidae. RIBAUT (1912) redescribed the only known *Macronicophilus* species, *M. ortonedae* SILVESTRI, 1909, with additional details, disputed its affinities to *Gonibregmatus* but did not suggest any firm placement for it. Later, in his world-wide monograph of Geophilomorpha, ATTEMS (1929) moved *Macronicophilus* to his Geophilidae Pachymeriinae, without any explanation. Since then, nobody seems to have either collected or studied these puzzling centipedes. The additional information provided by the specimens of the new taxa herewith described, and the results of cladistic analysis of Geophilomorpha (FODDAI, 1998; FODDAI & MINELLI, in press) show the isolated position of this genus, with its conspicuous autapomorphies (the 4 articles in the telopodite of second maxillae and the labrum provided with a double row of teeth), certainly far from the Gonibregmatidae and not close to the Geophilidae. Other derived traits, such as the length and shape of poison calyx, occur in this taxon together with plesiomorphic ones, such as kind and number of coxal organs and distribution of coxal pores.

The peculiar shape of forcipular coxosternum and the unusual mandible are further idiosyncratic traits of these centipedes (see descriptions below).

Genus *Macronicophilus* SILVESTRI, 1909

Diagnosis. - Labrum well developed, mid-piece not distinctly separated from the side-pieces. Dorsally and internally there is, at the level of the posterior external teeth, a series of small additional teeth. Pectinate lamellae of mandibles formed by relatively short and subtriangular teeth. First maxillae: lappets of coxosternum rudimentary or absent, lappets of telopodites present, telopodites of a single article, dorsal surface of telopodites with a "second lappet". Second maxillae: coxosternum not separated at the middle and without a sulcus along the sagittal plane; telopodites provided with 4 articles, the terminal one without apical claw. Forcipular segment: coxosternum short and large with well developed pleurae, pleuro-coxosternal sutures extending obliquely beyond to the outer margin, chitinous lines absent. Ungular blade flattened dorso-ventrally. Poison calyx long and near cylindrical. Ventral pores present. Coxopleura of the last leg-bearing segment provided with numerous single coxal organs which open independently on nearly the whole coxopleural surface. Telopodite of last legs of five podomeres. Last praetarsus unguiform. Anal organs present.

Macronicophilus abbreviatus n.sp. (Figs. 168-197)

Diagnosis.- This is the species with the lowest number of pairs of legs in the genus. Characters in table 4 and in the key below differentiate it from *M. unguiseta* n.sp., *M. venezolanus* n.sp. and *M. ortonedae* SILVESTRI, 1909.

Type material.- Holotype ♂, 39 p.l., b.l. 16 mm; allotype ♀, 41 p.l., b.l. 16 mm, both from Brazil: Amazonas: primary white-sand forest (campinarana), km 45 (02°30'S 60°10'W), 29.3.1988, J. Adis et al. leg. (both INPA).

Other material examined.- Brazil: Amazonas: terra firme, INPA, Manaus, secondary upland forest, 03°08'S 60°01'W, 24.4.1986, J. Adis et al. leg.: 1 ♂ juv., 39 p.l., b.l. 14 mm (JA); ibid., 02°30'S 60°10'W, terra firme, campinarana, primary white-sand forest, Km 45, 17.8.1988, J. Adis et al. leg.: 1 ♀ juv., 41 p.l., b.l. 12 mm (AM); ibid., 02°34'S 60°06'W, burned secondary upland forest, capoeira, 07/1990 - 02/1991, M. Olivia de A. Ribeiro leg.: 1 ♀ juv., 41 p.l., b.l. 14 mm (MLP).

Description.

Male holotype.- 39 pairs of legs, body length 16 mm, maximum body width 0.8 mm. Colour of preserved specimen in alcohol pale ochre.

Antennae ca. 3.1 times as long as the cephalic plate. Setae on a.a. I to V of different lengths, few in number; those of remaining articles progressively shorter and more numerous towards the tip of the appendage (Fig. 168). Terminal a.a. with ca. 10 claviform sensilla on the external border; ca. 9 on the internal border. Distal end of this a.a. with ca. 3-4 very small hyaline sensilla apparently not split apically. Number and distribution of sensilla on a.a. II, V, IX and XIII as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II	1	1		1	1		
V	1	1		1	1		
IX	1	1		1	2	1-2	
XIII	1	1		1	2	1-2	169, 170

Cephalic plate slightly longer than wide, with ratio 1.1:1, shape and chaetotaxy as in Fig. 171.

Clypeus with 2+2 setae on the middle (Fig. 172); clypeal area on a small round prominence with granular surface (Fig. 173).

Labrum with 32 teeth, subequal in length, the most lateral ones each with a long very sharp medial extension (Fig. 174). Internally (i.e., dorsally in respect to the main teeth row) there is a second row of ca. 60 very small teeth (*a*, Fig. 174). Form of unreticulated areas of side pieces as in Fig. 174.

Mandible: pectinate lamella with ca. 13 hyaline teeth, shape as in Fig. 175.

First maxillae apparently without lappets on coxosternum; telopodites with well developed lappets (Fig. 177). Coxosternum without setae; median projections of coxosternum relatively small with 2+3 small v. setae and 1+1 small d. setae (Figs. 176-177). Dorsal side of median projections with a hyaline projection ending in a round tip and provided with sensory papillae (Fig. 177). Telopodites of a single article with 7+7 v. setae and 1+1 d. setae, dorsal side with a very well developed hyaline prominence, provided with sensory papillae (Fig. 177).

Second maxillae: coxosternum with 2+3 large setae near the anterior margin and 5+6 smaller setae arranged as in Fig. 176. Apical article of telopodite conspicuously longer than wide (ratio 1.8:1) with 2+3 large and 1+1 small v. setae, 1+2 large and 1+1 small d. setae and numerous sharply pointed small sensilla on both sides (Figs. 178-179).

Forcipulae: when closed, the telopodites do not extend beyond the anterior margin of the head; basal plate with an irregular transverse median row of 10 large setae and a few smaller setae scattered on the posterior half. All articles of telopodite unarmed. Calyx of poison gland cylindrical (Fig. 181). Chaetotaxy of coxosternum and telopodites as in Fig. 180.

Shape and chaetotaxy of the legs (last pair excepted) uniform throughout the body length (Fig. 182). Claws with a very small ventrobasal seta near the posterior side (Fig. 183).

Sterna: pore fields present from the first to the penultimate sternum. All pore fields undivided. Form and relative size of fields changing along the trunk as in Figs. 184-190. Number of pores on selected sterna: on sternum I, 5 pores; on II, 16; on XIV, 34; on XVII, 41; on XXVIII, 65; on XXXV, 69; on XXXVIII, 45.

Last leg-bearing segment without pleurites at the sides of practergum. Praesternum weakly divided along the sagittal plane, tergum trapeziform, sternum as long as wide at the base, form and chaetotaxy of tergum and sternum as in Figs. 191-192. Coxopleura not protruding at the distal end, with few small setae distributed on almost the whole surface. Each coxopleuron with ca. 9 coxal organs opening independently on nearly the whole surface (Figs. 191-192).

Last legs with six podomeres: praefemur, femur and tibia very inflated, shape and chaetotaxy as in Figs. 191-192. Praetarsus unguiform with a very small v. seta near the internal side (Fig. 193), which also occurs in the remaining legs (Fig. 183).

Terminal segments: posterior margin of the intermediate tergum convex; posterior margin of the intermediate sternum and first genital sternum concave (Fig. 194). Gonopods biarticulate, basal article with ca. 5-6 setae, apical article with ca. 9 setae (Fig. 194), penis with 2+2 d. apical setae (Fig. 195).

Female allotype.- 41 pairs of legs, body length 16 mm, maximum body width 0.9 mm.

All features similar to those in the male except for the shape and chaetotaxy of the last leg-bearing segment and terminal segments.

Last leg-bearing segment: tergum trapeziform, sternum very narrow with length/width ratio as 1.5:1, form and chaetotaxy of tergum and sternum as in Figs. 196-197. Coxopleura slightly protruding at the distal v. end, with a few small setae distributed on almost the whole surface. Shape and chaetotaxy of last legs as in Figs. 196-197.

Terminal segments: intermediate tergum as in Fig. 196, intermediate sternum seemingly covered by the sternum of the last leg-bearing segment (Fig. 197); first genital sternum as in Fig. 197; gonopods uniarticulate.

Etymology.- The name *abbreviatus* refers to the low number of trunk segments.

Remarks.- The type specimens have a pale coloration and the body does not seem to be very well sclerotized. Nevertheless, the two specimens are certainly adult, as suggested in the male by the

development of last pair of legs, gonopods and penis (the latter, with apical setae present), even if there are no mature spermatozoa inside the body. The female has apparently some mature ova but the two spermathecae are empty.

Macronicophilus ortonedae SILVESTRI, 1909 (Figs. 198-204)

Macronicophilus Ortonedae SILVESTRI 1909a - Rend. R. Acc. Lincei (5)18(1): 267
Macronicophilus Ortonedae: SILVESTRI 1909b - Boll. Lab. Zool. gen. agr. Portici 4: 51 pl VIII, 1-9
Macronicophilus Ortonedae: RIBAUT 1912 - Mém. Soc. Neuchât. Sci. nat. 5: 87, figs 16-25
Macronicophilus ortonedae: ATTEMS 1929 - Tierreich 52: 276
Macronicophilus ortonedae: BÜCHERL 1940 - Mem. Ist. Butantan 13: 313

Diagnosis.- This is the only species of *Macronicophilus* with posterior half of the clypeal surface not reticulate and strongly sclerotized. Characters in table 4 and in the key below differentiate it from the other species in the genus.

Type locality. - Ecuador: Naranjito (close to Guayaquil).

Known range. - Ecuador: Naranjito (close to Guayaquil); Colombia: Cafetal Camelia, close to Angelopolis.

Macronicophilus unguiseta n.sp. (Figs. 205-237)

Diagnosis.- A *Macronicophilus* species with the whole clypeal surface reticulate, as in *M. abbreviatus* n.sp. and *M. venezolanus* n.sp.. Characters in table 4 and in the key below differentiate it from these species and from *M. ortonedae* SILVESTRI, 1909.

Type material. - Holotype ♂, 53 p.l., b.l. 18 mm. Brazil: Amazonas: Rio Tarumã Mirim, capoeira (soil extraction), 29.12.1982, J. Adis legit.

Depository of type: INPA.

Description

Male holotype. - 53 pairs of legs, body length 18 mm, maximum body width 0.7 mm. Colour of preserved specimen in alcohol pale ochre.

Antennae ca. 3.0 times as long as the cephalic plate, distally not attenuate. Setae on a.a. I to V of various lengths, few in number; those of remaining articles shorter, much more numerous (Fig. 205). Terminal a.a. with ca. 6 claviform sensilla on the external border, ca. 13 on the internal border (Fig. 206). Distal end of this a.a. with ca. 4 very small hyaline sensilla apparently not split apically (Fig. 206). Number and distribution of sensilla on a.a. II, V, IX and XIII as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II	1	1		1	1		207, 208
V	1	1		1	1		209, 210
IX	1	1		1	3		211, 212
XIII	1	1		1	3		213

Cephalic plate as long as wide, shape and chaetotaxy as in Fig. 214.

Clypeus with 2+2 anteromedial setae, the two most anterior ones on the clypeal area (Fig. 215). The latter is not well defined, not elevated and with surface very densely reticulate.

Labrum with ca. 36 teeth, the lateral ones sharply pointed (Fig. 216). Internally (i.e., dorsally in respect to the main teeth row) there is a second row of ca. 67 very small teeth (Fig. 217: *a*). Form of

unreticulated areas of side pieces as in Fig. 216.

Mandible: pectinate lamella with ca. 12 hyaline teeth (Fig. 218).

First maxillae with a very small coxosternal lappet; telopodites with well developed lappets (Fig. 220). Coxosternum without setae; median projections of coxosternum relatively small, with 3+4 v. and 1+1 very small d. setae (Figs. 219-220). Dorsal side of median projections with a hyaline projection ending in a rounded tip similar to a lappet and covered by sensory papillae (Fig. 220). Telopodites of one article only, with 7+8 v. and 1+1 very small dorsolateral setae (Figs. 219-220).

Second maxillae: coxosternum with 1+2 setae near the anterior margin and 7+9 smaller setae arranged as in Fig. 221. Apical article of telopodite longer than wide (length/width ratio 1.37:1) with 2 setae and numerous small sharply pointed sensilla on both sides (Figs. 222-223).

Forcipulae: when closed, the telopodites do not extend beyond the anterior margin of the head. Basal plate with ca. 22 setae arranged as in Fig. 224. All articles of telopodites unarmed. Ungulum dorso-ventrally flattened. Calyx of poison gland cylindrical (Figs. 226-227). Chaetotaxy of coxosternum and telopodites as in Figs. 224-225.

Shape and chaetotaxy of legs (last pair excepted) uniform throughout the body length (Fig. 228). Claws ventrobasally with a very small seta near the posterior side (Fig. 229).

Sterna: pore fields present from the first to the penultimate sternum. All pore fields undivided. Form and relative size of fields changing along the trunk as in Figs. 230-233. Number of pores on selected sterna: on sternum I, 26 pores; on II, 34; on X, 46; on LII, 34.

Last leg-bearing segment without pleurites at the sides of praetergum. Praesternum divided along the sagittal plane, tergum trapeziform, sternum with lateral margins converging posteriad, form and chaetotaxy of tergum and sternum as in Figs. 234-235.

Coxopleura slightly protruding at their distal v. ends with few small setae distributed on almost the whole surface. Each coxopleuron with ca. 12-14 coxal organs (Fig. 236) opening independently on nearly the whole surface (Figs. 234- 235). Last legs with six podomeres, shape and chaetotaxy as in Figs. 234-235. Praetarsus unguiform, with a very small v. seta near the internal side (similar to the other legs as in Fig. 229).

Terminal segments: posterior margin of the intermediate tergum and sternum slightly convex; posterior margin of the first genital sternum straight (Figs. 234-235). Gonopods biarticulate, basal article with ca. 4, distal article with ca. 7 setae (Fig. 237); penis with 2+2 d. apical setae. Anal organs present.

Female. - Unknown.

Etymology. - The name *unguiseta* refers to the small ventrobasal seta close to the posterior border of the leg claws.

Remark. - Despite its very small size the male described here is adult, in so far as it contains mature spermatozoa.

Macronicophilus venezolanus n.sp. (Figs. 238-275)

Diagnosis. - In this species the whole clypeal surface is reticulated, as in *M. abbreviatus* n.sp. and *M. unguiseta* n.sp. Characters in table 4 and in the key below differentiate it from these species and from *M. ortonedae* SILVESTRI, 1909.

Type material. - Holotype ♀, 55 p.l., b.l. 32 mm. Venezuela: Bocono: Guaramacal, La Laguna 2000 m. a.s.l. bosque humedo montano. II.1987, M.G. Paoletti leg. (AM). Allotype ♂, 53 p.l., b.l. 20 mm. Venezuela: Aragua: Rancho Grande, Parque Pittier, 1200 m. a.s.l., selva nublada, II.1987, M.G. Paoletti leg. (MLP).

Other material examined. - 1 juv. (sex ?), 55 p.l., b.l. 10 mm. Venezuela: Bocono: Andes, Guaramacal, 2500 m a.s.l., bosque humedo montano, II.1987, M.G. Paoletti leg. (AM).

Description

Female holotype. - 55 pairs of legs, body length 32 mm, maximum body width 1.3 mm. Colour of

preserved specimen in alcohol pale ochre.

Antennae ca. 3.7 times as long as the cephalic plate, distally very slightly attenuate. Setae on a.a. I to V of various length, few in number; those of remaining articles progressively shorter, more numerous towards the tip of the appendage (Fig. 238). Terminal a.a. with ca. 9 claviform sensilla on the external border and ca. 12 on the internal border (Fig. 239). Distal end of this a.a. with ca. 3 very small hyaline sensilla apparently not split apically (Fig. 239). Number and distribution of sensilla on a.a. II, V, IX and XIII as follows:

	ventral			dorsal			Figs.
	a	*b*	*c*	*a*	*b*	*c*	
II		1		1	1		240, 241
V	1	1		1	1		242, 243
IX	1	1		1	2	1	244
XIII	1	1		1	2	2	245

Cephalic plate as long as wide, shape and chaetotaxy as in Fig. 246.

Clypeus with 1+1 anteromedial setae at both sides of the very densely reticulated clypeal area (Fig. 247), which is not raised.

Labrum with 52 teeth, the most lateral ones with a long very sharp medial extension (Fig. 248). Internally (i.e., dorsal in respect to the main teeth row) there is a second row of ca. 140 very small teeth (Fig. 249: a). Form of unreticulated areas of side-pieces as in Fig. 248.

Mandible: pectinate lamella with ca. 8 hyaline teeth, shape as in Fig. 250.

First maxillae with very small lappets on the coxosternum; telopodites with well developed lappets (Fig. 252). Coxosternum without setae; median projections of coxosternum relatively small, with 1 big and 1 small v. setae and 1 small d. seta (Figs. 251-252). Dorsal side of median projections with a hyaline projection ending in a rounded tip, covered by sensory papillae (Fig. 252). Telopodites formed by a single article with 7+8 large v. setae and 1 very small dorso-lateral seta (Figs. 251-252).

Second maxillae: coxosternum with 2+1 big setae near the anterior margin and 12+13 smaller setae arranged as in Fig. 251. Apical article of telopodite conspicuously longer than wide (ratio 1.8: 1) with 6-8 v. setae, 8-9 d. setae and numerous sharply pointed small sensilla on both sides (Figs. 253-254).

Forcipulae: when closed, the telopodites do not extend beyond the anterior margin of the head. Basal plate with an irregular transverse median row of 8 large setae and a few smaller setae scattered on the posterior half. All articles of telopodites unarmed. Ungulum dorso-ventrally flattened. Calyx of poison gland cylindrical (Fig. 256). Chaetotaxy of coxosternum and telopodites as in Fig. 255.

Shape and chaetotaxy of legs (last pair excepted) uniform throughout the body length (Fig. 257). Claws ventrobasally with a very small seta near the posterior side (Fig. 258).

Sterna: pore fields present from the first to the penultimate sternum. All pore fields undivided. Form and relative size of fields changing along the trunk as in Figs. 259-267. Number of pores on selected sterna: on sternum I, 26 pores; on II, 54; on III, 82; on VII, 111; on XVII, 160; on XXVII, 191; on XLVI, 227; on LIII, 143; on LIV, 84.

Last leg-bearing segment without pleurites at the sides of praetergum. Praesternum divided along the sagittal plane, tergum trapeziform, sternum very narrow with length/width ratio as 2:1, form and chaetotaxy of tergum and sternum as in Figs. 268-269. Coxopleura protruding at their distal v. ends, with a few small setae distributed on almost the whole surface. Each coxopleuron with ca. 19-24 coxal organs opening independently on nearly the whole surface (Figs. 268-269).

Last legs with six podomeres, shape and chaetotaxy as in Figs. 268-269. Praetarsus unguiform with a very small v. seta near the internal side (similar to the remaining legs as in Fig. 258).

Terminal segments: intermediate tergum with posterior margin convex, intermediate sternum seemingly covered by the sternum of the last leg-bearing segment (Figs. 270-271); first genital sternum as in Fig. 269. Anal organs present.

Male allotype. - 53 pairs of legs, body length 20 mm, maximum body width 0.8 mm.

The legs of the five leg-bearing segments preceding the last (XLVIII to LII) differ in shape from those of the remaining segments: praefemur, femur and tibia are relatively wider and show an apico-ventral projection ending in a rounded tip (Figs. 270-271: a). All other features similar to those in the female, except for the shape and chaetotaxy of the last leg-bearing segment and the terminal segments.

Last leg-bearing segment: tergum trapeziform, sternum with lateral margins strongly converging posteriad with length/width ratio (at the base) as 1.2:1, form and chaetotaxy of tergum and sternum as in Figs. 272-273. Coxopleura slightly protruding at their distal v. ends, with few setae distributed on almost the whole surface. Podomeres of terminal legs not inflated, shape and chaetotaxy as in Figs. 272-273.

Terminal segments: posterior margin of the intermediate tergum convex; posterior margin of the intermediate sternum straight; first genital sternum with posterior margin slightly convex (Figs. 272-273). Gonopods biarticulate, basal article with ca. 7 setae, distal article with ca. 12 setae (Fig. 274), dorsal aspect of penis with 1+1 setae (Fig. 275).

Etymology. - The name refers to Venezuela, the country where this species has been collected.

Remarks. - This species is remarkable for its sexual dimorphism affecting the five leg-bearing segments precedent the last.

The specimens described here are adult, as shown by the presence in the body of the female of mature ova and of two spermathecae full of spermatozoa; the reproductive organs of the male are also full of spermatozoa.

Key to the species of *Macronicophilus*

1. 39-41 pairs of legs; last pair of legs of the ♂ greatly crassate (Fig. 191) . . . . . *M. abbreviatus* n.sp.
- At least 53 pairs of legs; last pair of legs of the ♂ not crassate (Figs. 204, 235, 273) 2
2. Posterior half of clypeus not reticulated and strongly sclerotized (Fig. 198); clypeal area on a raised prominence (Fig. 199) . . . . . *M. ortonedae* SILVESTRI
- All clypeus reticulated, clypeal area not raised 3
3. Labrum with ca. 52 teeth; shape of unreticulated areas of side-pieces as in Fig. 248; apical article of telopodite of second maxillae with length/width ratio as 1.8:1, shape as in Figs. 253-254 and with ca. 8 setae; regular curvature of the external and internal edge of the forcipular tarsungulum beginning after the broad basal tenth (Figs. 255-256) . . . . . *M. venezolanus* n.sp.
- Labrum with ca. 36 teeth; shape of unreticulated areas of side-pieces as in Fig. 216; apical article of telopodite of second maxillae with length/width ratio as 1.37:1, shape as in Figs. 222-223 and with ca. 2 setae; regular curvature of the external and internal edge of the forcipular tarsungulum uniform along the whole length of the tarsungulum (Figs. 224-226) . . . . . *M. unguiseta* n.sp.

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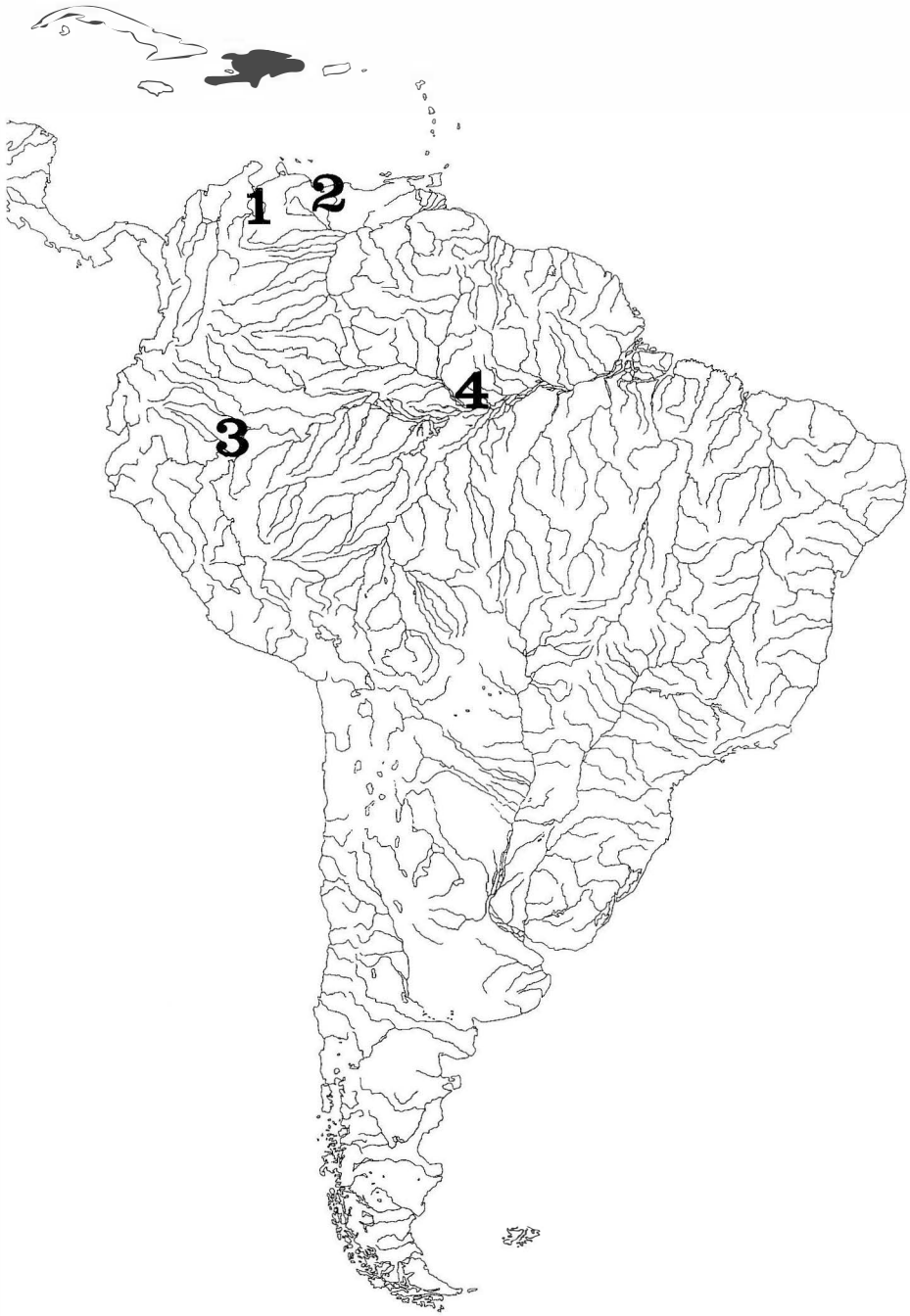
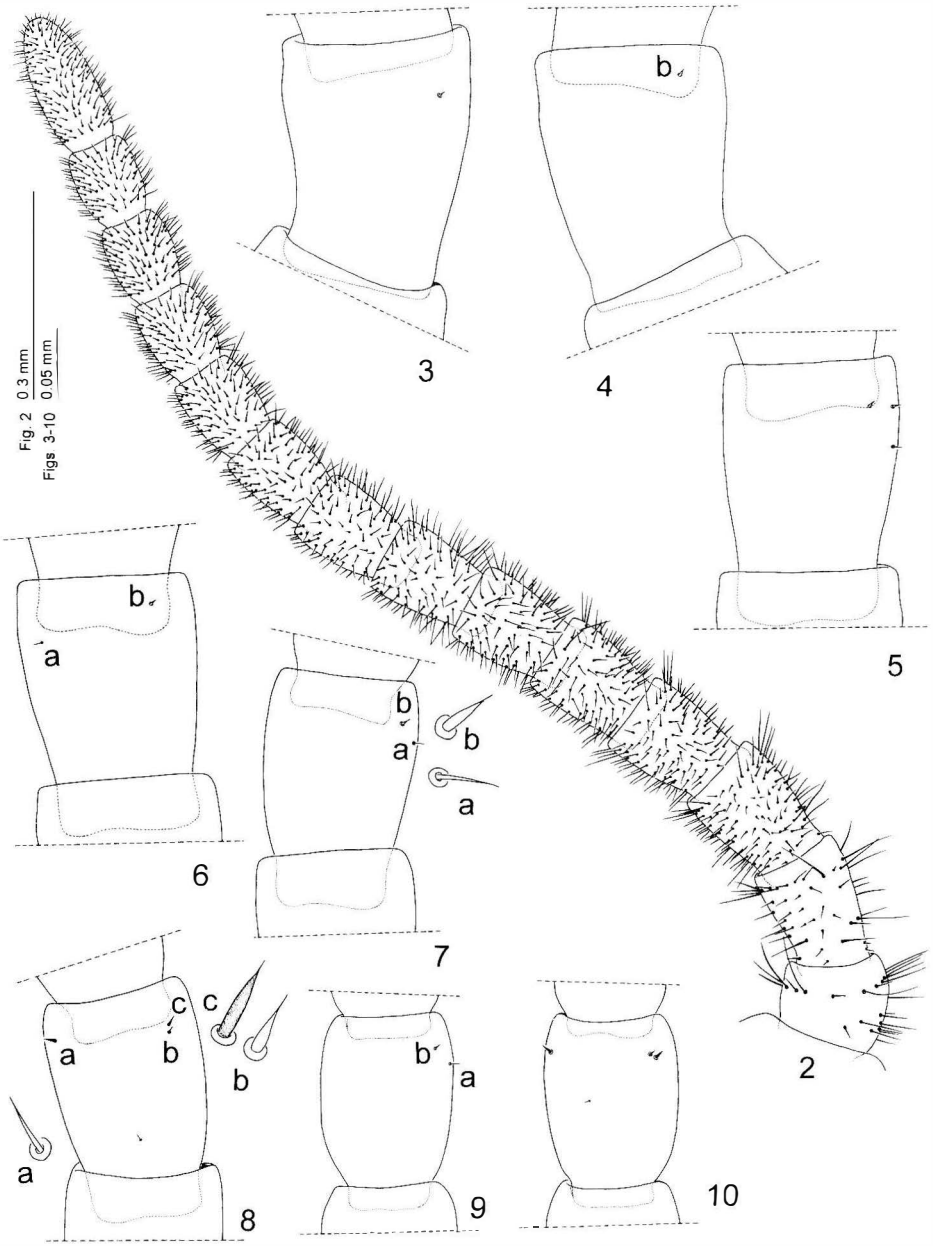
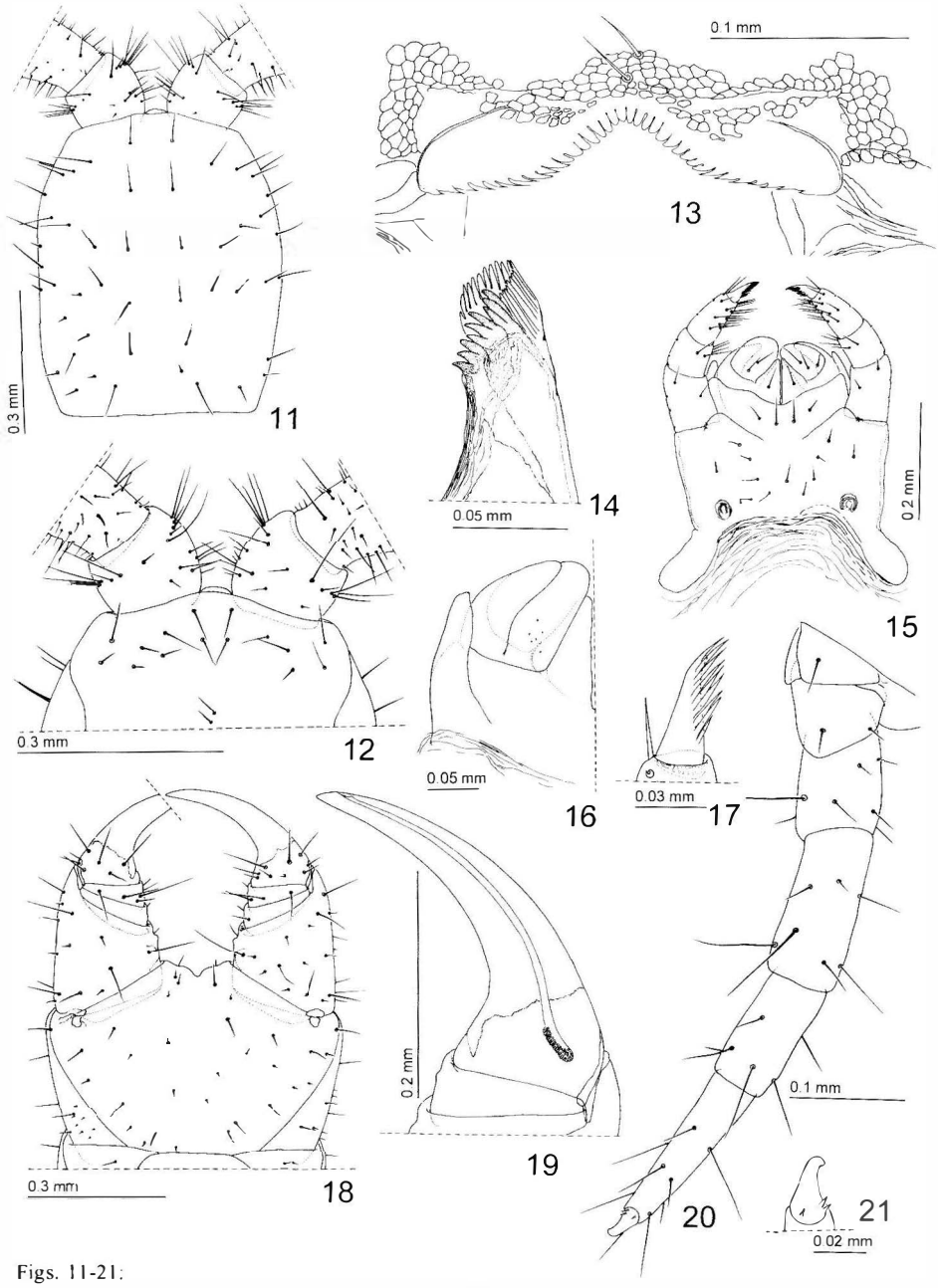


Fig. 1:
Map showing the localities where the specimens described in this paper were collected **1**, Venezuela: Bocono; **2**, Venezuela: Aragua; **3**, Peru: Iquitos; Brazil: Amazonas: Manaus and other localities quoted in the lists of specimens.



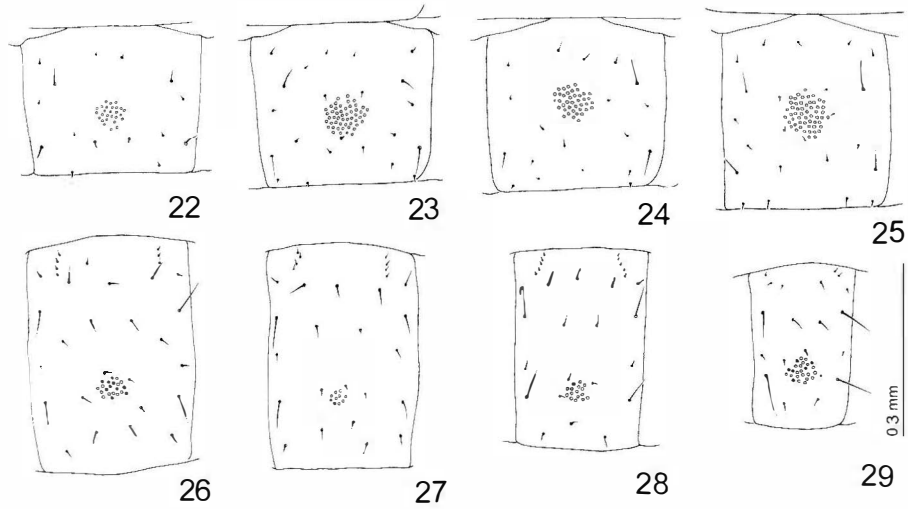
Figs. 2-10:
Pectiniunguis geayi (BRÖLEMANN & RIBAUT, 1911), ♂, Brazil: Amazonas: Lago Janauari.
2: r. antenna, v.; **3**: r. a.a. II, v.; **4**: r. a.a. II, d.; **5**: r. a.a. V, v.; **6**: r. a.a. V, d.; **7**: r. a.a. IX, v.; **8**: r. a.a. IX, d.; **9**: r. a.a. XIII, v.; **10**: r. a.a. XIII, d.



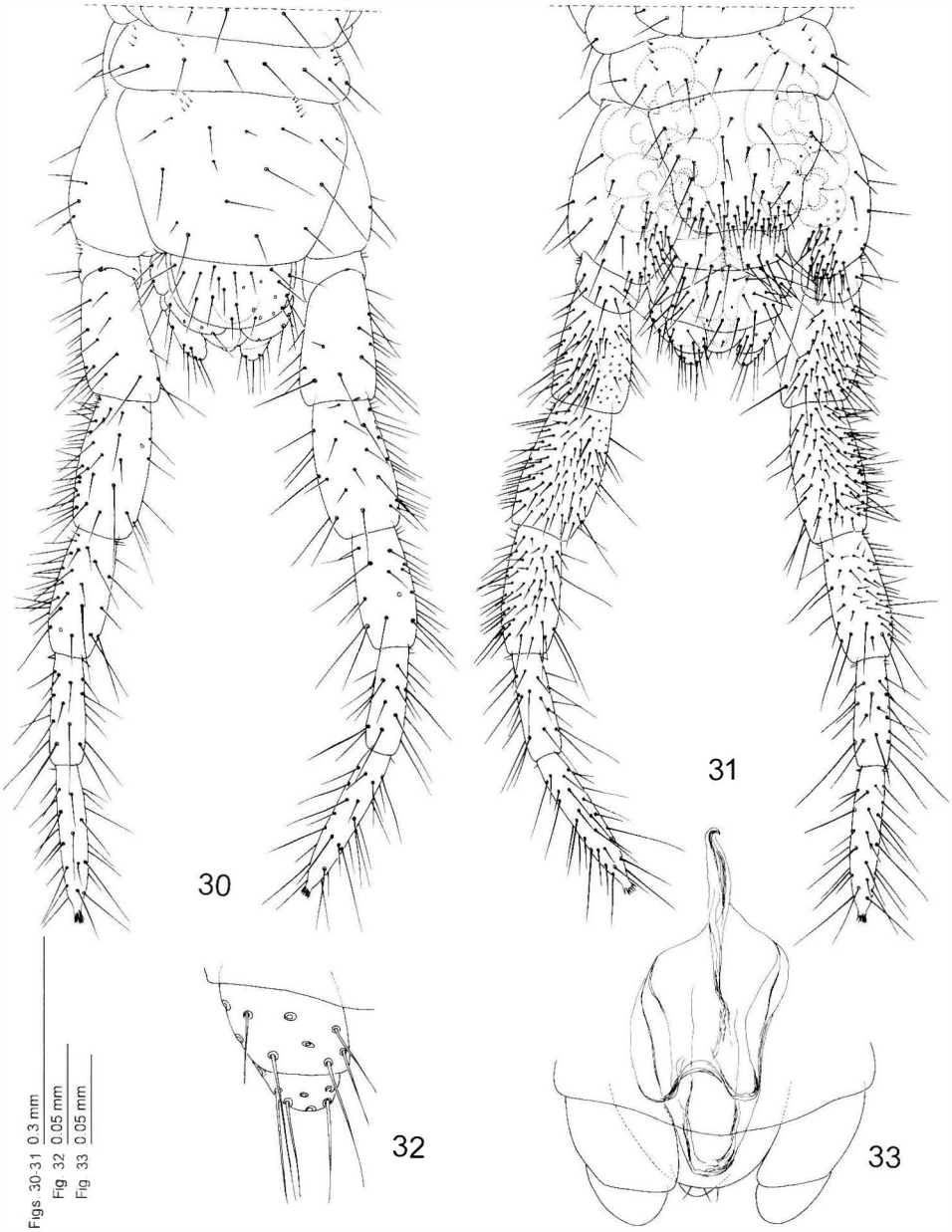
Figs. 11-21:

Pectiniunguis geayi (BRÖLEMANN & RIBAUT, 1911), ♂, Brazil: Amazonas: Lago Janauari.

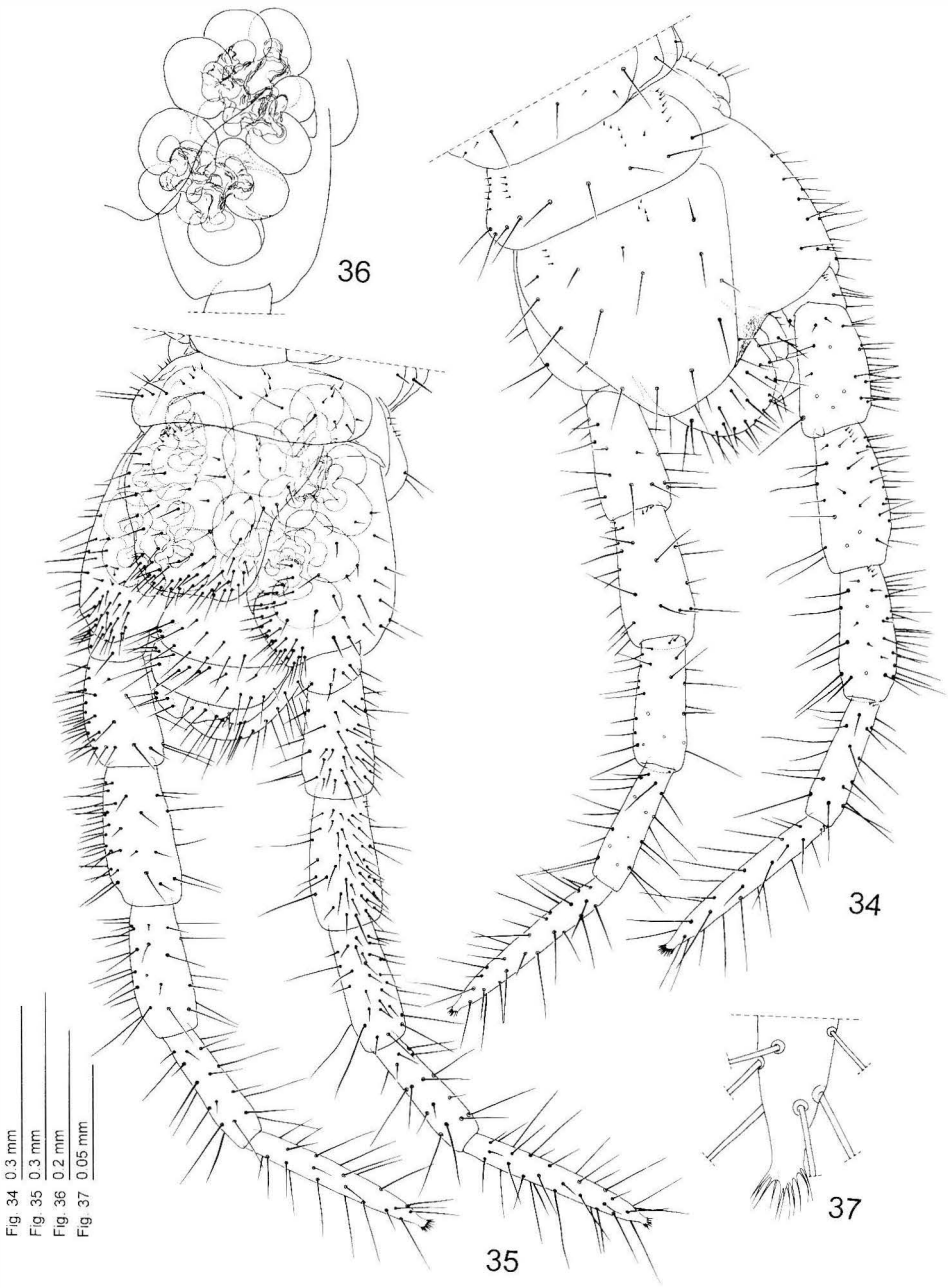
11: cephalic shield; **12**: clypeus and bases of antennae; **13**: labrum; **14**: r. mandible; **15**: first and second maxillae, v.; **16**: l. first maxilla, d.; **17**: claw of r. second maxilla, v.; **18**: forcipular segment with poison claws, v.; **19**: detail of poison gland in l. poison claw, v.; **20**: l. leg. XXI, v.; **21**: claw of l. leg XXI, antero-v.



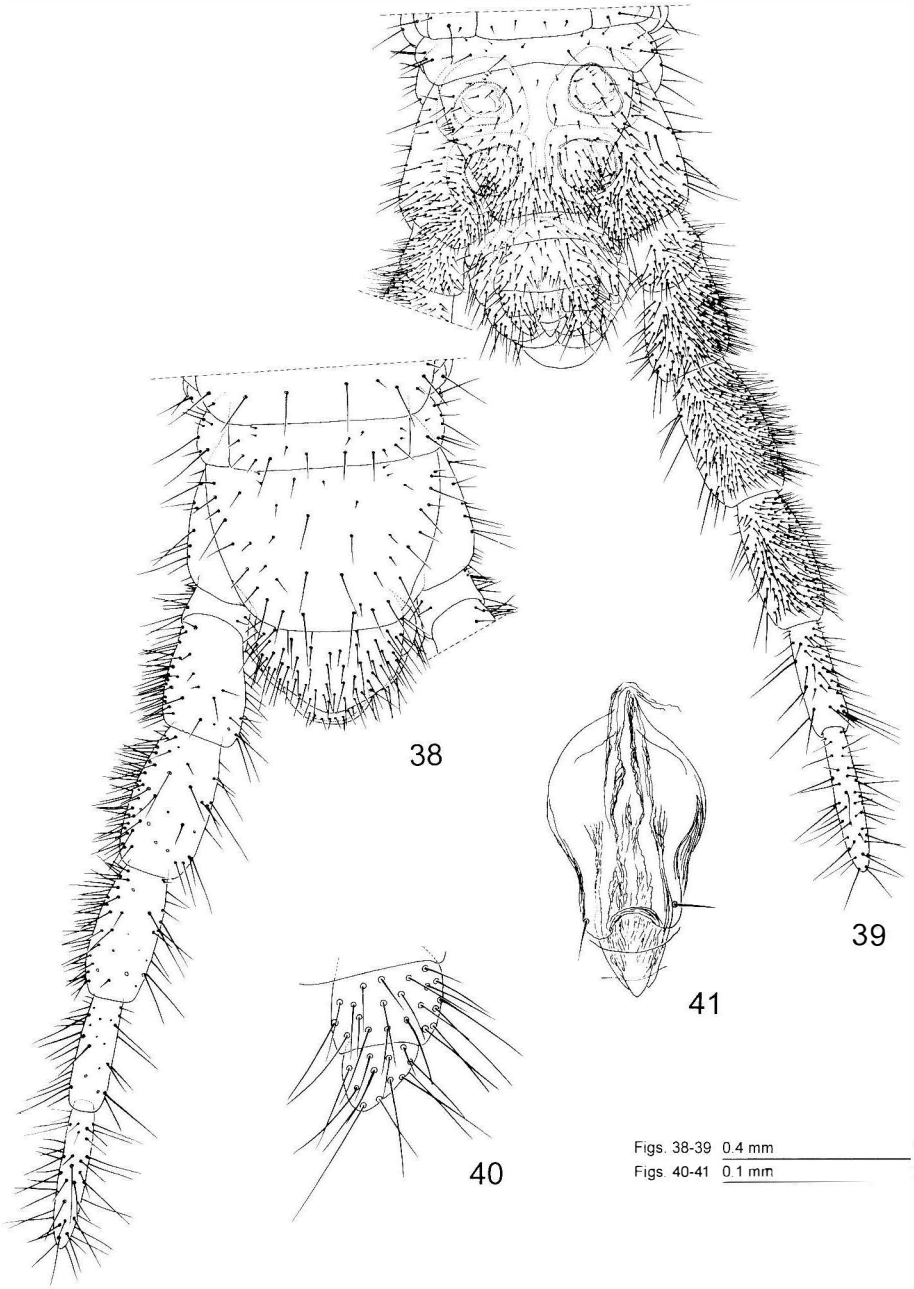
Figs. 22-29:
Pectiniunguis geayi (BRÖLEMANN & RIBAUT, 1911), ♂, Brazil: Amazonas: Lago Janauari.
22-29: sterna II, IV, IX, XV, XXIII, XXXVII, XLIII, XLVII.



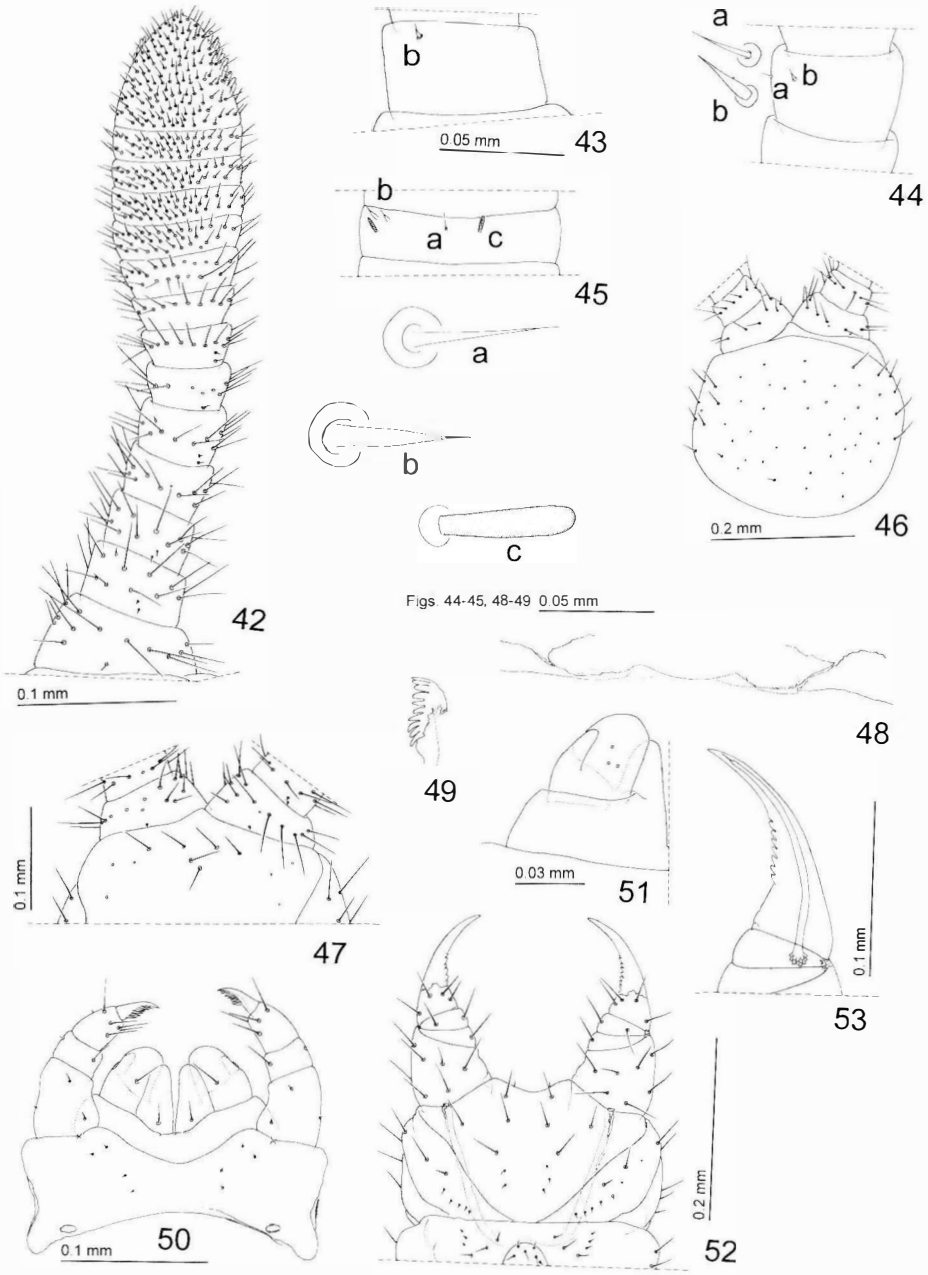
Figs. 30-33:
Pectiniunguis geayi (BRÖLEMANN & RIBAUT, 1911), ♂, Brazil: Amazonas: Lago Janauari.
30: last leg-bearing segment and terminal segments, d.; **31**: the same, v.; **32**: r. gonopod, v.; **33**: penis and gonopods, v.



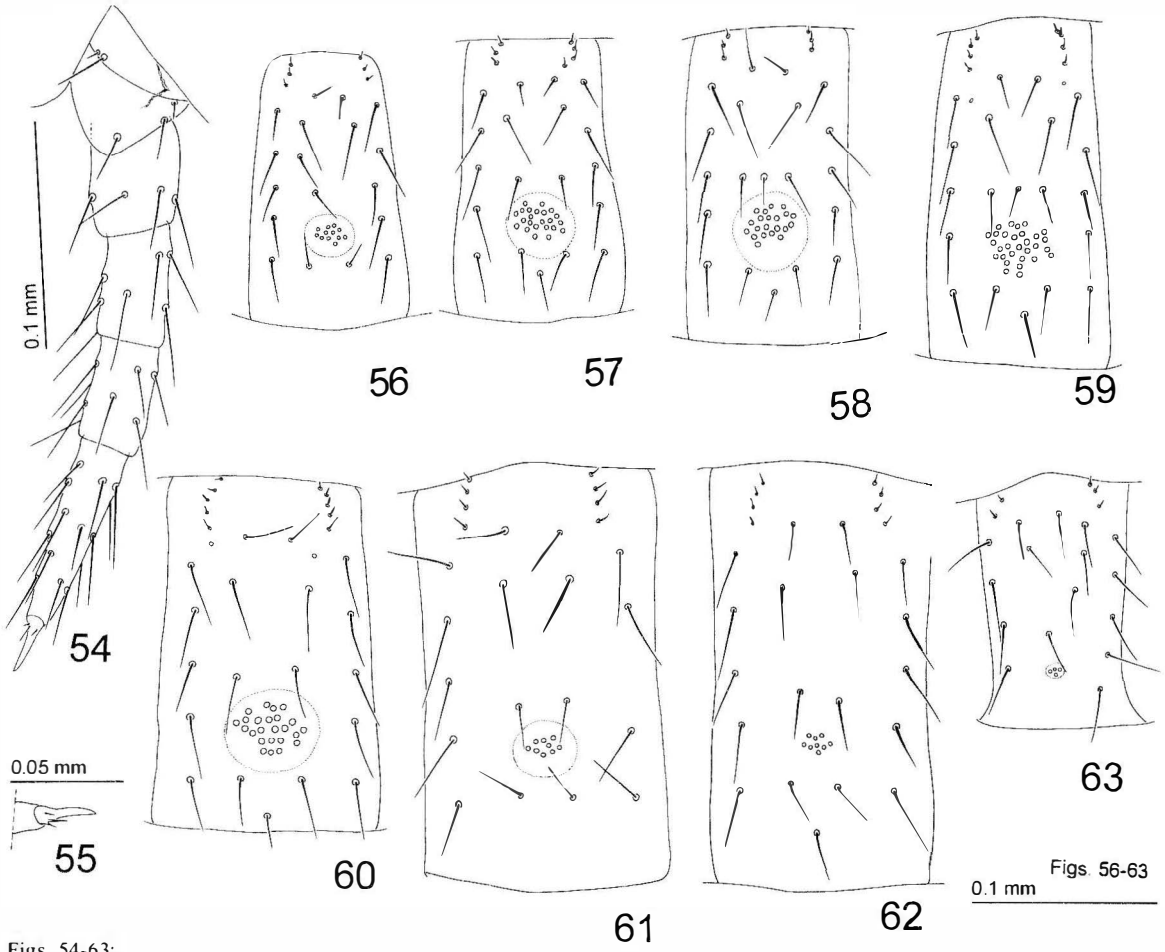
Figs. 34-37:
Pectiniunguis geayi (BRÖLEMANN & RIBAUT, 1911), ♀, Brazil: Amazonas: Lago Janauari.
34: last leg-bearing segment and terminal segments, d.; **35**: the same, v.; **36**: l. coxal organs, v.; **37**: detail of distal end of last podomere of l. last leg, d.



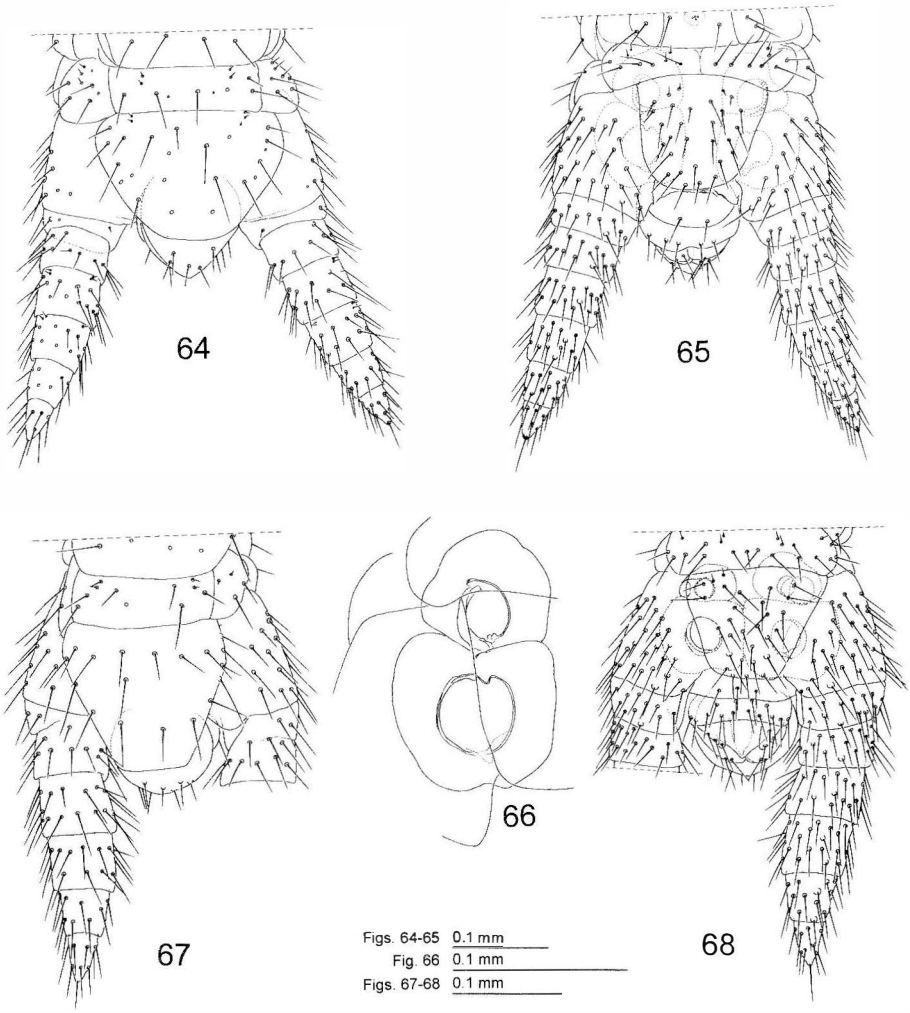
Figs. 38-41:
Schendylops marchantariae (PEREIRA, MINELLI & BARBIERI, 1995), ♂ allotype, Brazil: Amazonas: Ilha de Curari.
38: last leg-bearing segment and terminal segments, d.; **39**: last leg-bearing segment and terminal segments, v.; **40**: l. gonopod, v.; **41**: penis, d.



Figs. 42-53:
Ityphilus calinus CHAMBERLIN, 1957, ♀, specimen A, Brazil: Amazonas: 02°34' S 60°06' W.
42: l. antenna, v.; **43**: l. a.a. II, v.; **44**: l. a.a. V, v.; **45**: l. a.a. XIII, d.; **46**: cephalic shield; **47**: clypeus and base of antennae; **48**: labrum; **49**: dentate lamella of r. mandible; **50**: first and second maxillae, v.; **51**: l. first maxilla, d.; **52**: forcipular segment with poison claws, v.; **53**: detail of calyx of poison gland in l. poison claw, v.



Figs. 54-63:
Ityphilus calinus CHAMBERLIN, 1957, ♀, specimen A, Brazil: Amazonas: 02°34'S 60°06'W.
54: l. leg XXX, v.; **55**: claw of l. leg XXX, v.; **56-63**: sterna II, III, V, VIII, XVII, XXVII, XXXV, XLII.



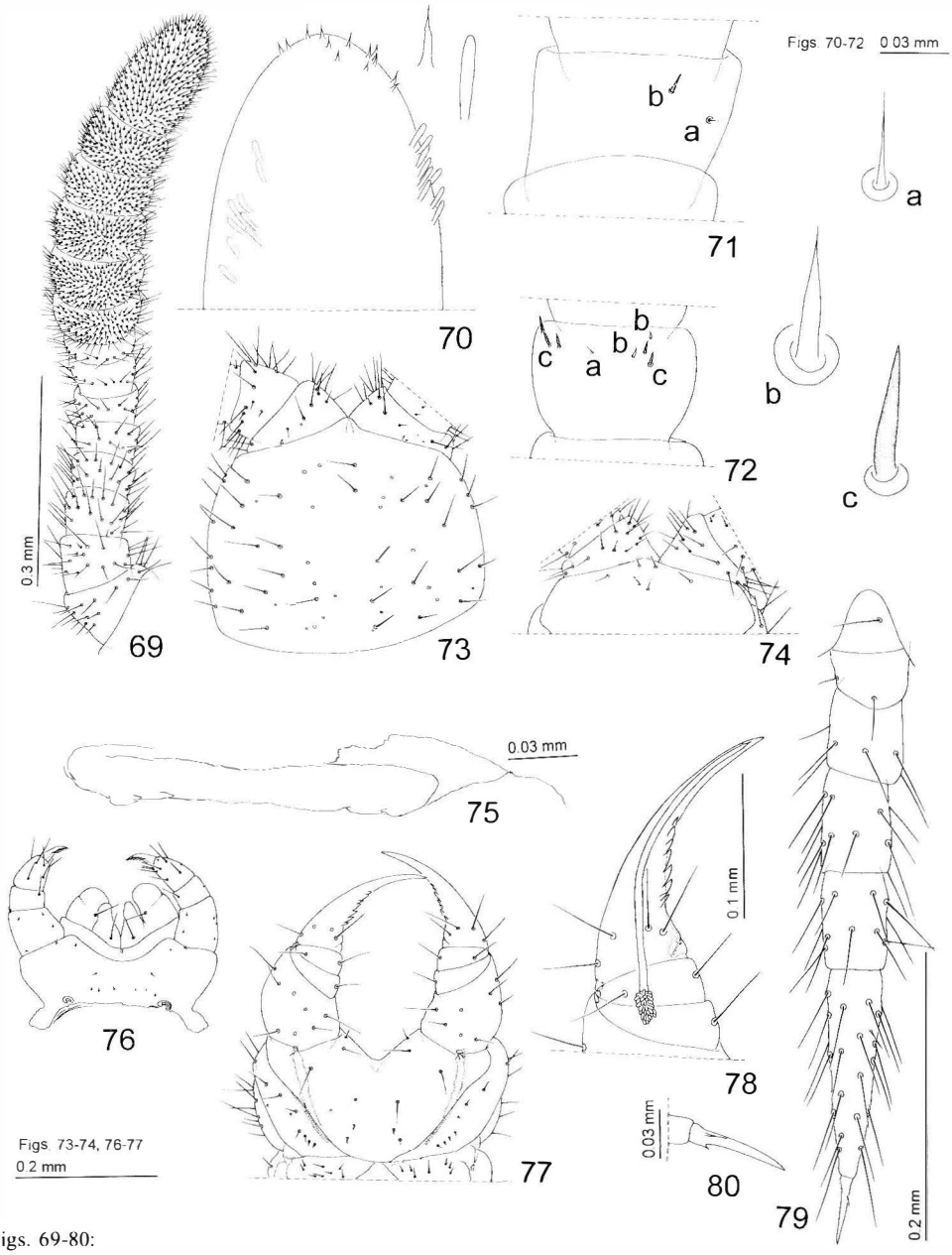
Figs. 64-68:

Ityphilus calinus CHAMBERLIN, 1957, ♀, specimen A, Brazil: Amazonas: 02°34' S 60°06' W.

64: last leg-bearing segment and terminal segments, d.; **65**: the same, v.; **66**: detail of r. coxal organs, v.

Ityphilus calinus CHAMBERLIN, 1957, ♂, specimen B, Brazil: Amazonas: 02° 34' S 60° 06' W.

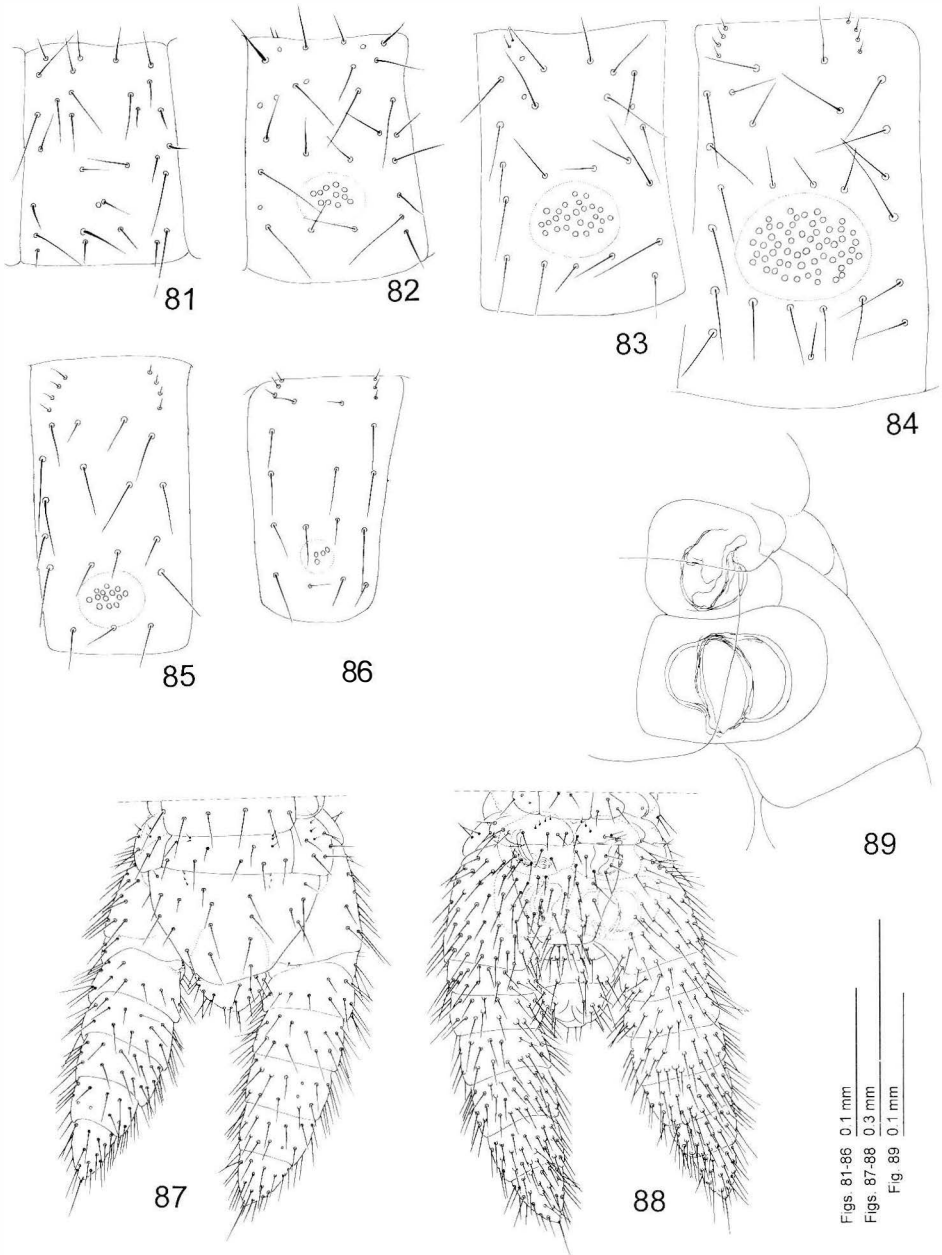
67: last leg-bearing segment and terminal segments, d.; **68**: the same, v.



Figs. 69-80:

Ityphilus saucius n.sp., ♀ holotype, Brazil: Amazonas: 02°34' S 60°06' W.

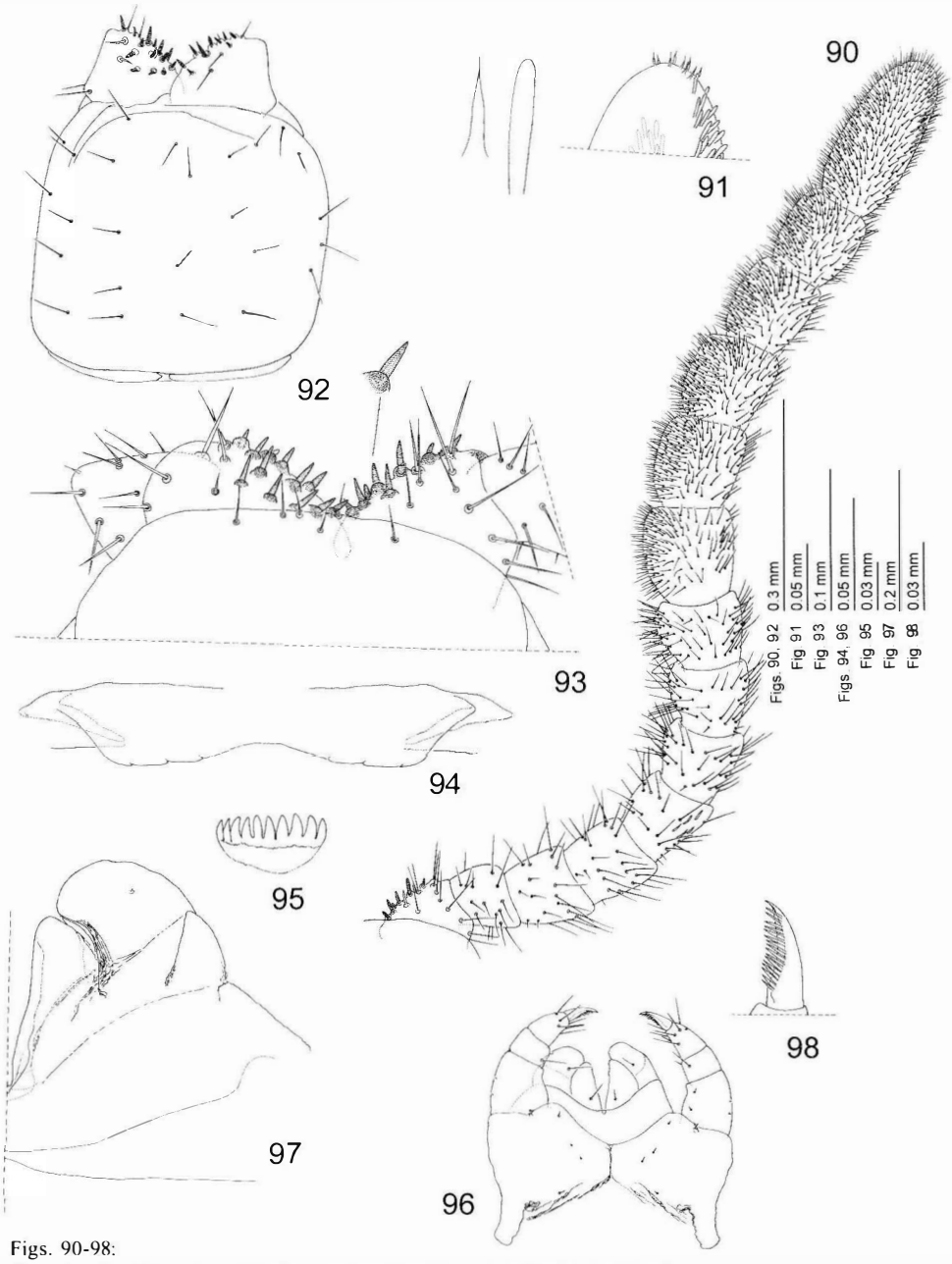
69: l. antenna, v.; **70**: apical half of r. a.a. XIV, v.; **71**: r. a.a. V, v.; **72**: r. a.a. XIII, d. (*a*, *b*, *c*, the three types of sensilla occurring on several antennal articles: details at higher magnification); **73**: cephalic shield; **74**: clypeus and bases of antennae; **75**: labrum; **76**: first and second maxillae, v.; **77**: forcipular segment with poison claws, v.; **78**: detail of calyx of poison gland in r. poison claw, v.; **79**: r. leg III, v.; **80**: claw of r. leg II, v.



Figs. 81-89:

Ityphilus saucius n.sp., ♀ holotype, Brazil: Amazonas: 02°34' S 60°06' W.

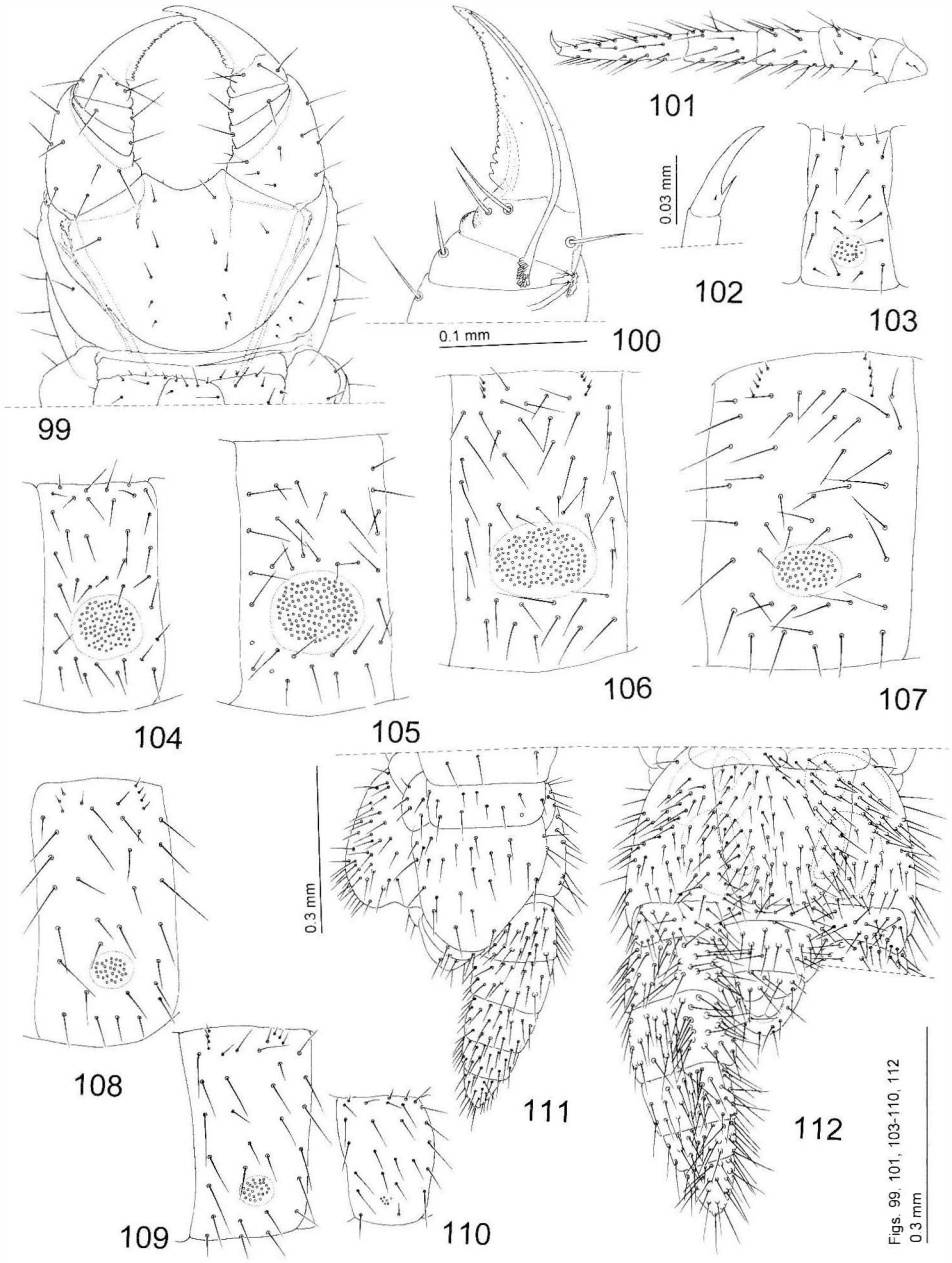
81-86: sterna II, III, V, XIV, sternum preceding the antepenultimate, antepenultimate; **87**: last leg-bearing segment and terminal segments, d.; **88**: the same, v.; **89**: detail of l. coxal organs, v.



Figs. 90-98:

Ityphilus sensibilis n.sp., ♀ holotype, Brazil: Amazonas: 02°34' S 60°06' W.

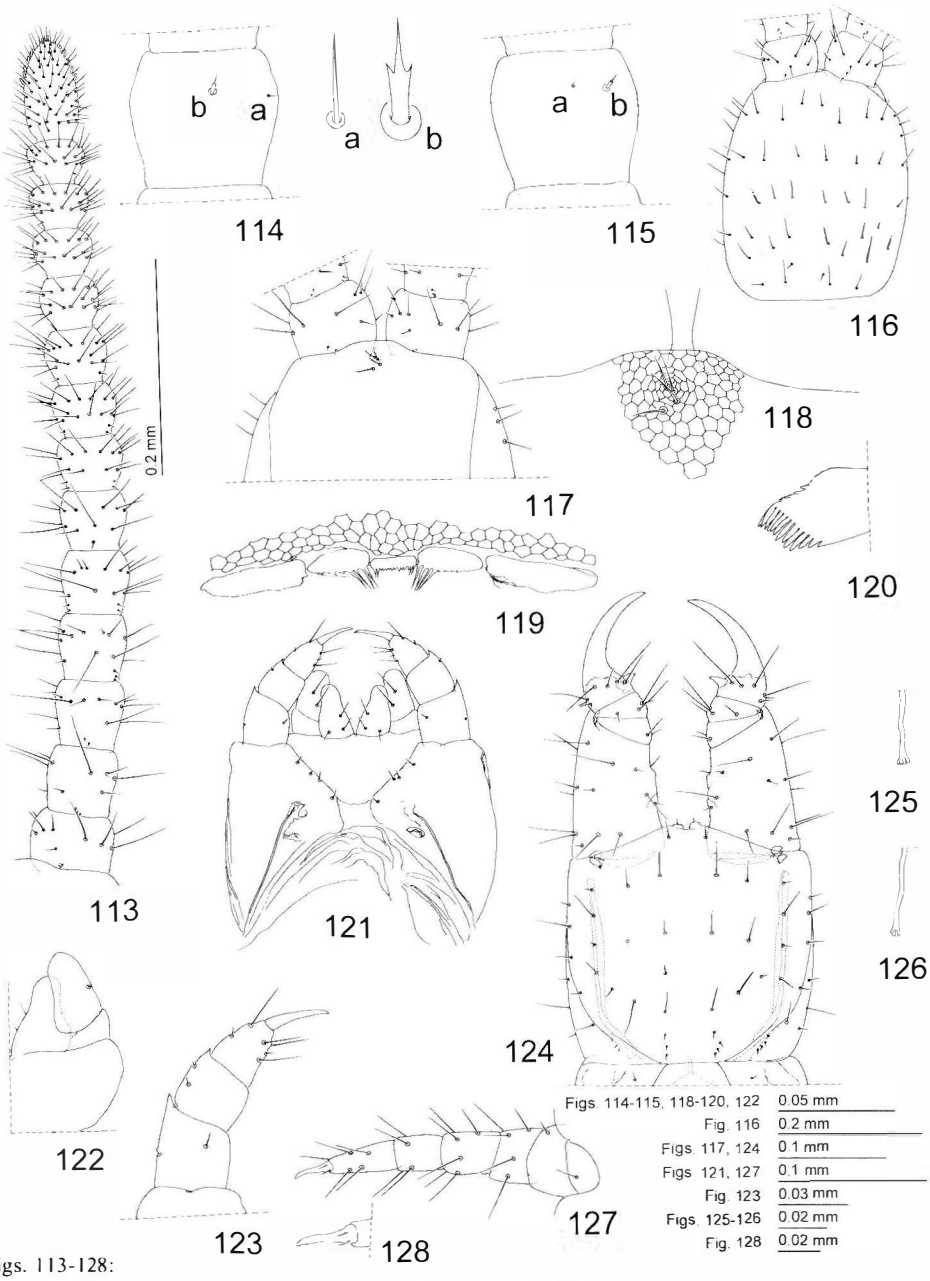
90: l. antenna, ventro latero-external view; **91**: apex of l. a.a. XIV, ventro latero-external view; **92**: cephalic shield; **93**: clypeus and base of antennae; **94**: labrum; **95**: dentate lamella of r. mandible; **96**: first and second maxillae, v.; **97**: r. first maxilla, d.; **98**: claw of r. second maxilla, d.



Figs. 99-112:

Ityphilus sensibilis n.sp., ♀ holotype, Brazil: Amazonas: 02°34' S 60°06' W.

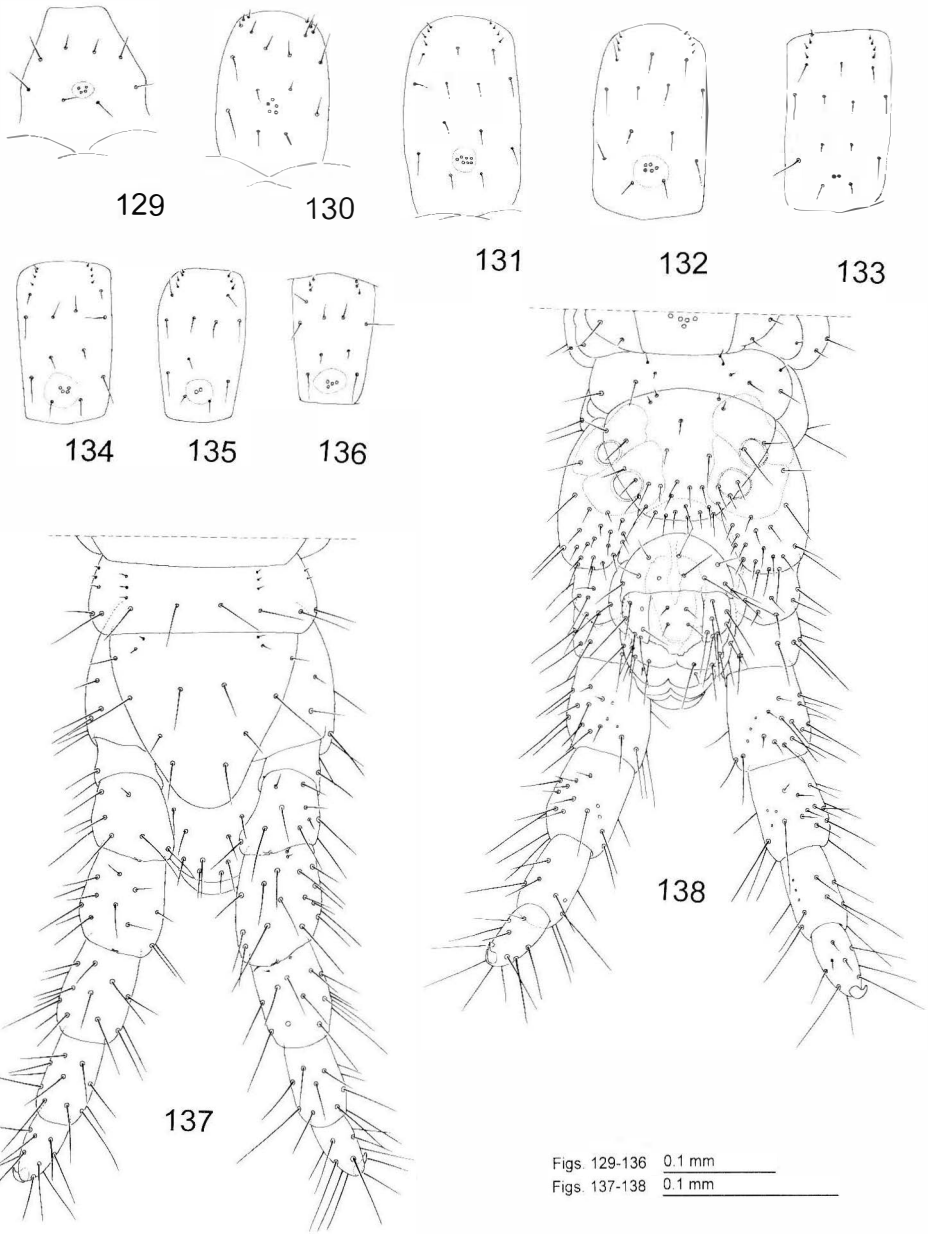
99: forcipular segment with poison claws, v.; **100**: detail of calyx of poison gland in l. poison claw, v.; **101**: l. leg II, v.; **102**: claw of l. leg VI, antero-v.; **103-110**: sterna III, X, XVII, XXIII, XXXVIII, LIV, LVI, LX.; **111**: last leg-bearing segment and terminal segments, d., **112**: the same, v.



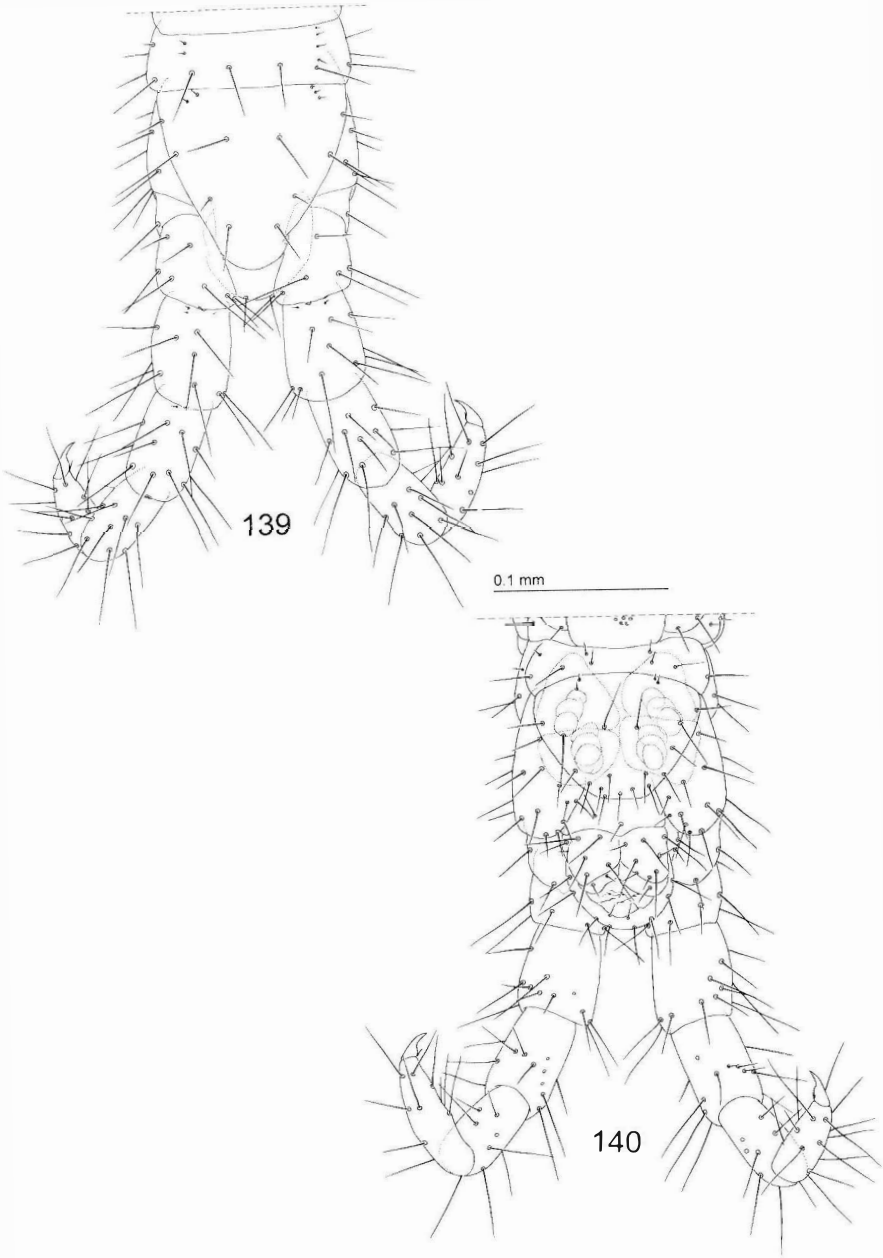
Figs. 113-128:

Hyphydrophilus projectus n.sp., ♂ holotype. Brazil: Amazonas: 02°30' S 60°10' W.

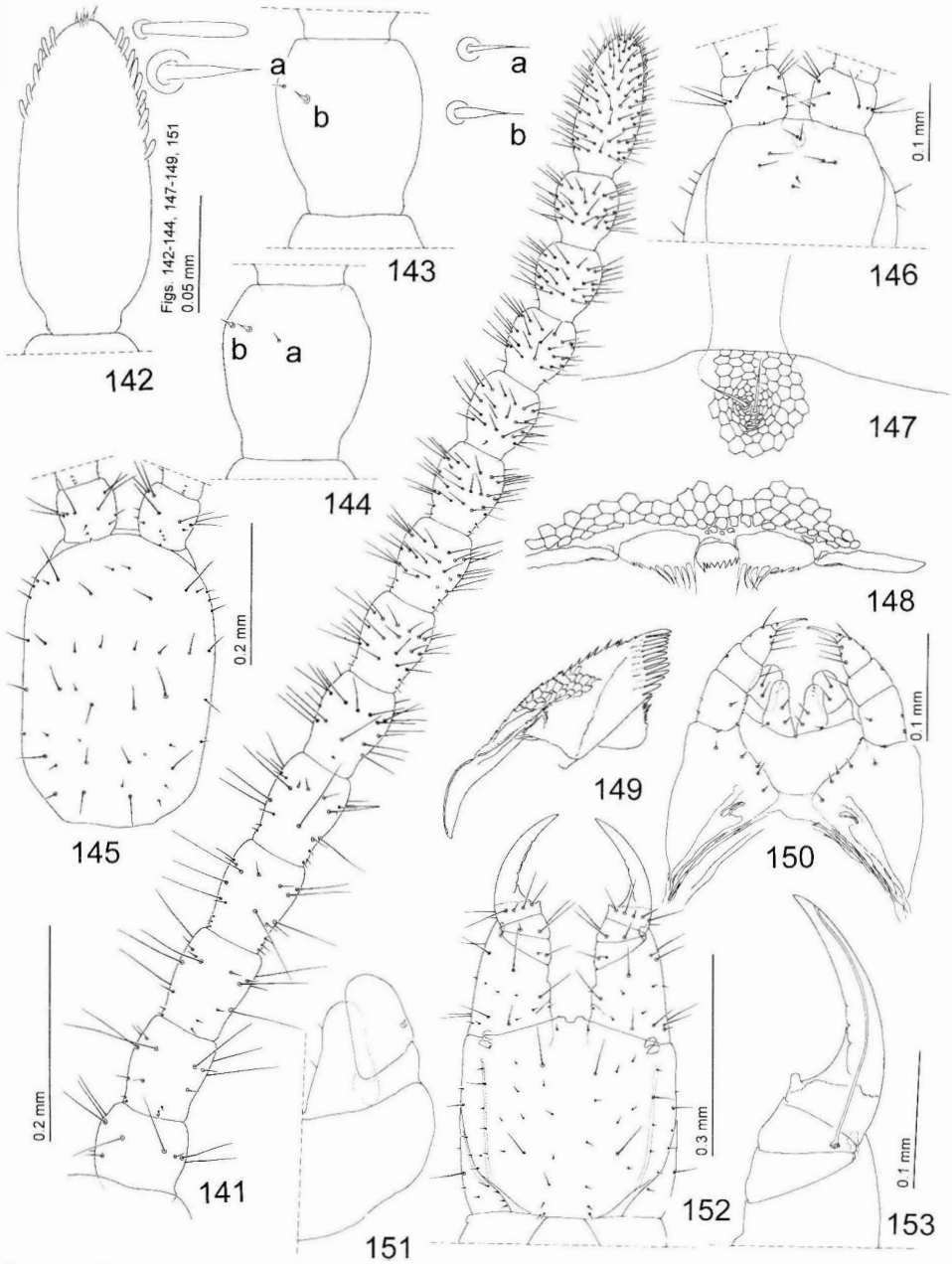
113: l. antenna, v.; **114**: r. a.a. V, v. (*a*, *b*, the two types of sensilla occurring on several antennal articles: details at higher magnification); **115**: r. a.a. V, d.; **116**: cephalic shield; **117**: clypeus and base of antennae; **118**: clypeal area; **119**: labrum; **120**: apex of r. mandible; **121**: first and second maxillae, v.; **122**: r. first maxilla, d.; **123**: telopodite of l. second maxilla, d.; **124**: forcipular segment with poison claws, v.; **125**: detail of calyx of r. poison gland, v.; **126**: detail of calyx of l. poison gland, v.; **127**: r. leg III, v.; **128**: claw of r. leg III, v.



Figs. 129-138:
Hyphydrophilus projectus n.sp., ♂ holotype, Brazil: Amazonas: 02°30' S 60°10' W.
129-136: sterna I, II, XIV, XV, XXX, XXXIV, XXXV, XXXVI; **137**: last leg-bearing segment and terminal segments, d.; **138**: the same, v.



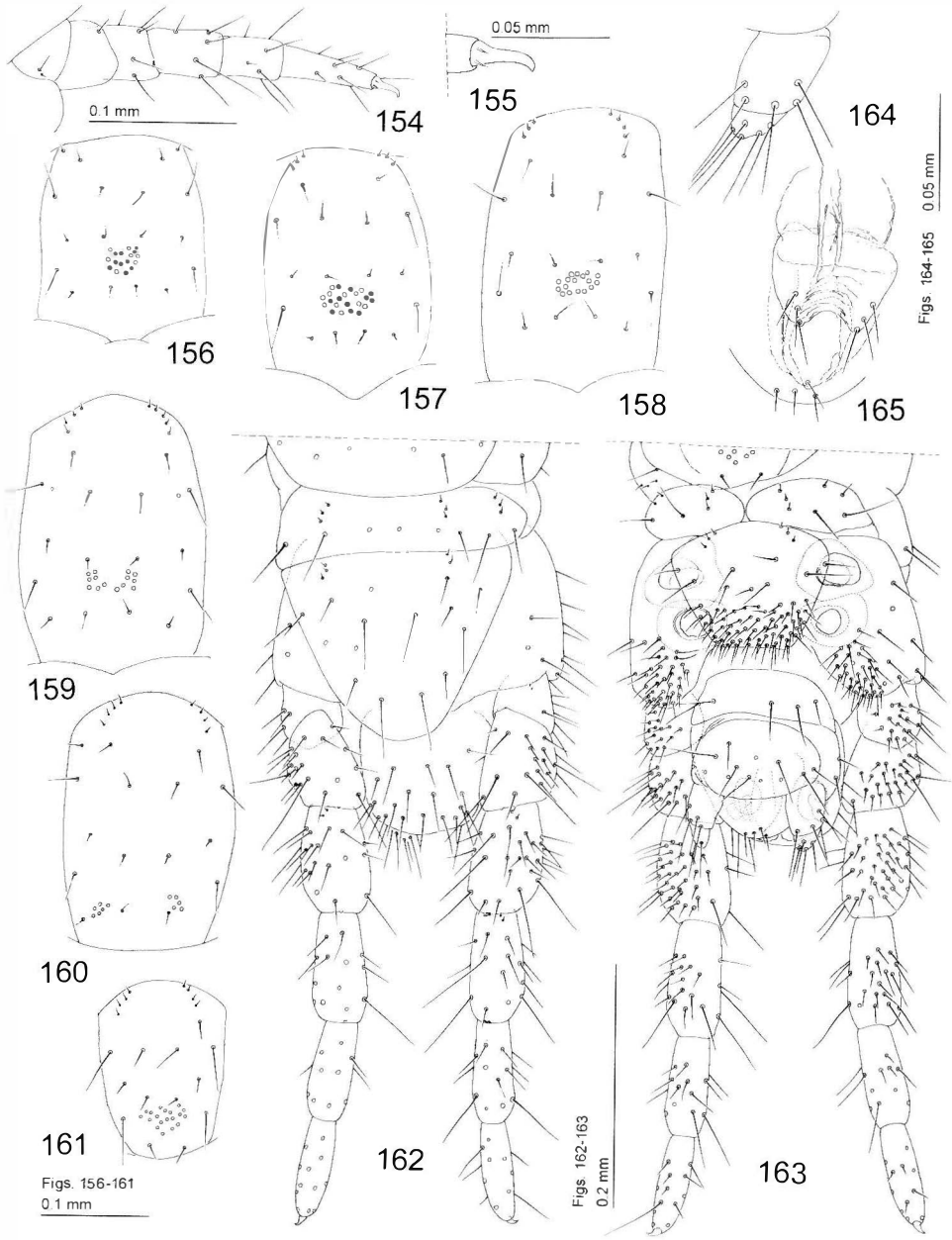
Figs. 139-140:
Hyphydrophilus projectus n.sp., ♀ allotype, Brazil: Amazonas: 2°30' S 60°10' W.
139: last leg-bearing segment and terminal segments, d.; **140**: the same, v.



Figs. 141-153:

Ribautia onychophaena n.sp., ♂ holotype, Brazil: Amazonas: 02°34' S 60°06' W.

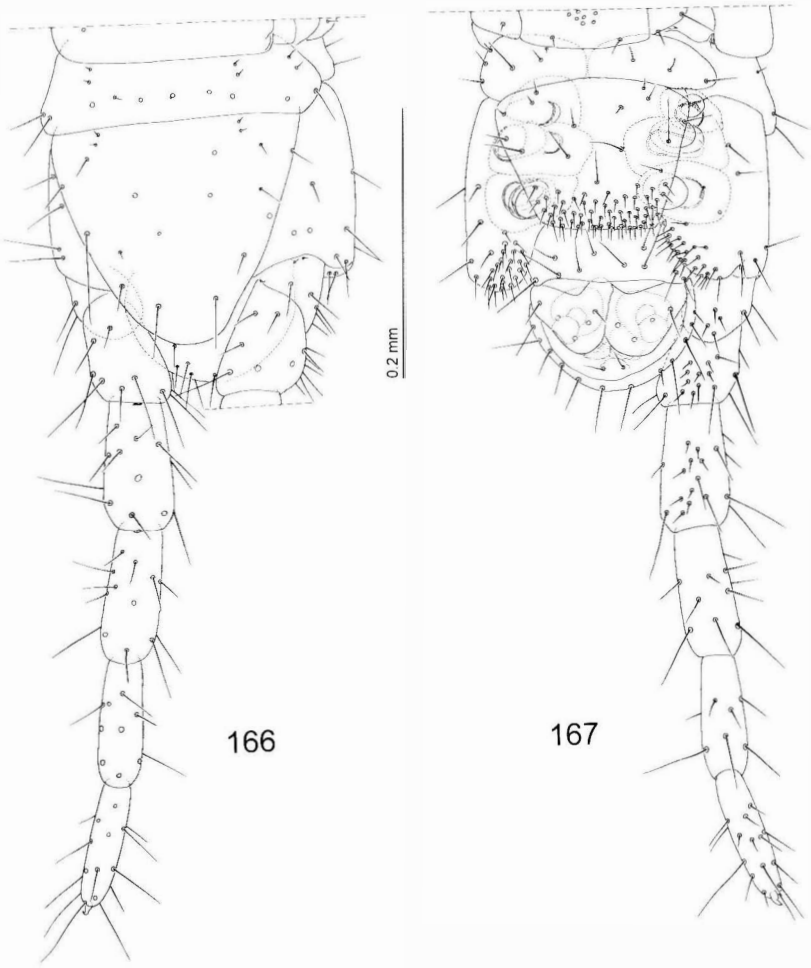
141: l. antenna, v.; **142**: l. a.a. XIV, v.; **143**: l. a.a. IX, v.; **144**: l. a.a. IX, d. (*a*, *b*, the two types of sensilla occurring on several antennal articles: details at higher magnification); **145**: cephalic shield; **146**: clypeus and base of antennae; **147**: clypeal area; **148**: labrum; **149**: r. mandible; **150**: first and second maxillae, v.; **151**: r. first maxilla, d.; **152**: forcipular segment with poison claws, v.; **153**: detail of calyx of poison gland in l. poison claw, v.



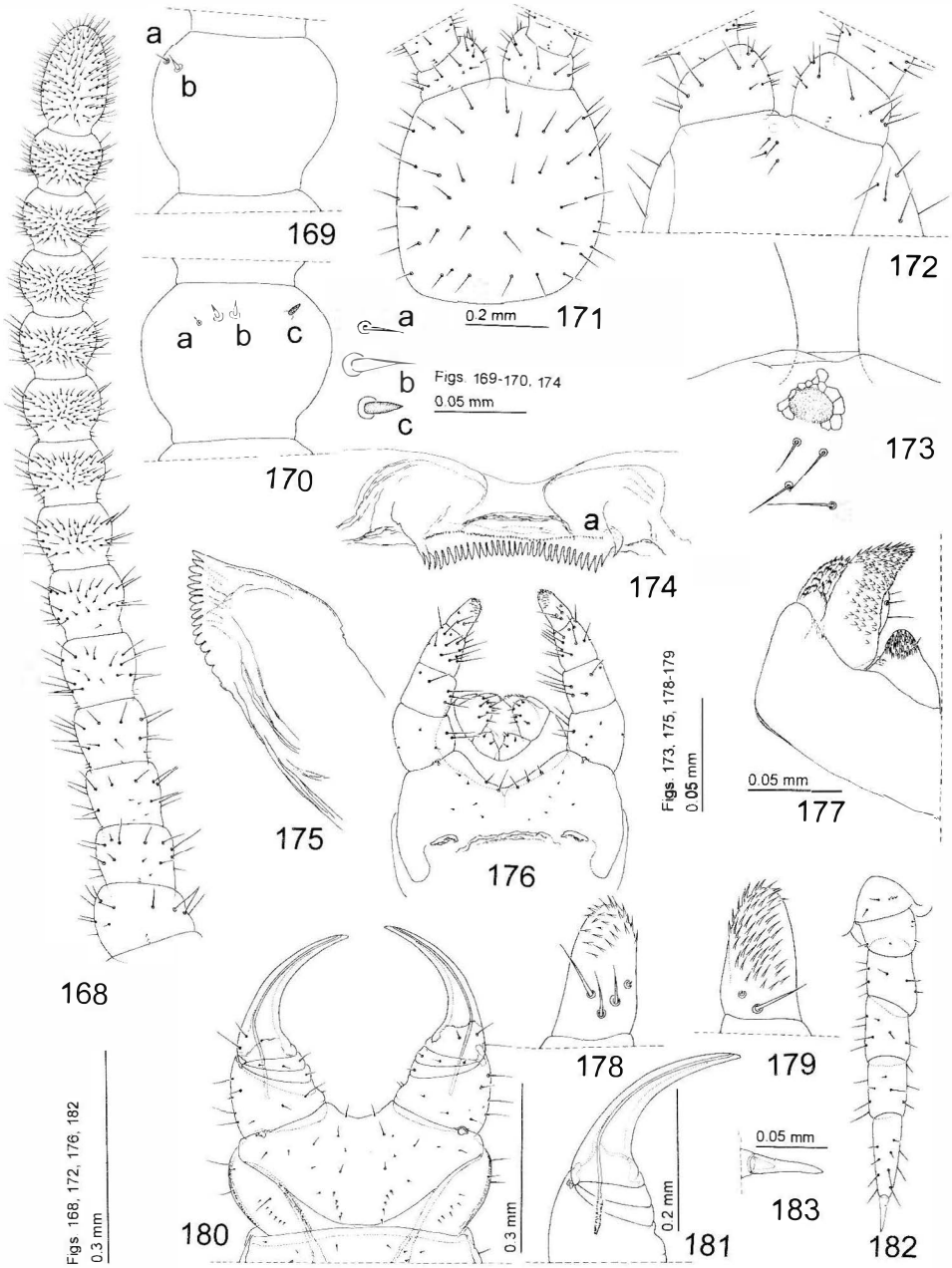
Figs. 154-165:

Ribautia onychophaena n.sp., ♂ holotype, Brazil: Amazonas: 02°34' S 60°06' W.

154: l. leg XII, v.; **155**: claw of l. leg XII, v.; **156-161**: sterna II, VI, XIII, XIV, XXXIII, XXXVIII; **162**: last leg-bearing segment and terminal segments, d.; **163**: the same, v.; **164**: l. gonopod, v.; **165**: penis, d.



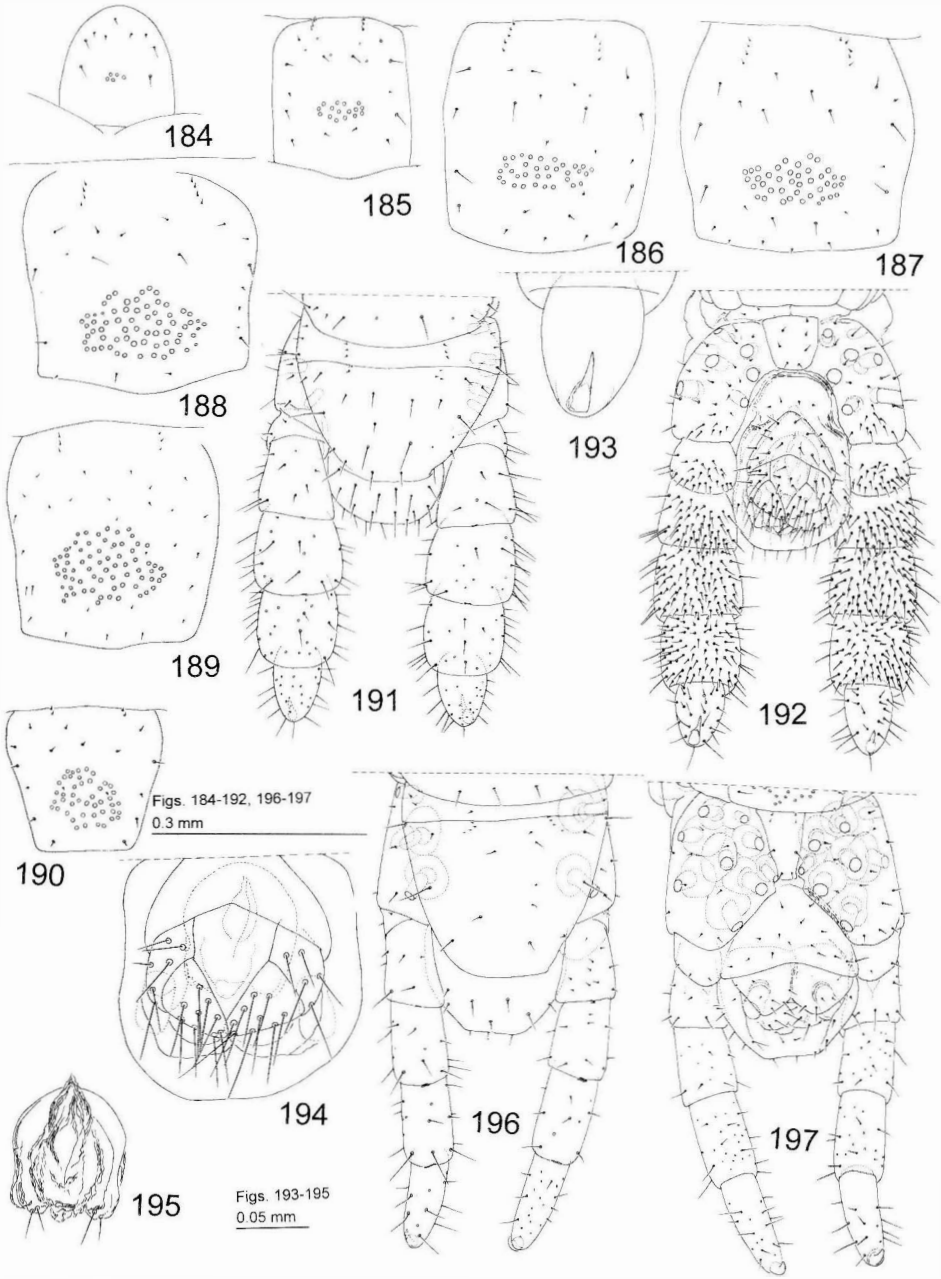
Figs. 166-167:
Rhabutia onychophaena n.sp., ♀ allotype, Brazil: Amazonas: 02°34' S 60°06' W.
166: last leg-bearing segment and terminal segments, d.; **167**: the same, v.



Figs. 168-183:

Macronicophilus abbreviatus n.sp., ♂ holotype, Brazil: Amazonas: 02°30'S 60°10'W.

168: l. antenna, v.; **169**: l. a.a. XIII, v.; **170**: r. a.a. XIII, d. (*a*, *b*, *c*, the three types of sensilla occurring on several antennal articles: details at higher magnification); **171**: cephalic shield; **172**: clypeus and base of antennae; **173**: clypeal area; **174**: labrum (*a*: dorsal (internal) teeth); **175**: r. mandible; **176**: first and second maxillae, v.; **177**: l. first maxilla, d.; **178**: detail of distal end of telopodite of l. second maxilla, v.; **179**: the same, d.; **180**: forcipular segment with poison claws, v.; **181**: detail of calyx of poison gland in r. poison claw, v.; **182**: r. leg III, v.; **183**: claw of r. leg III, v.



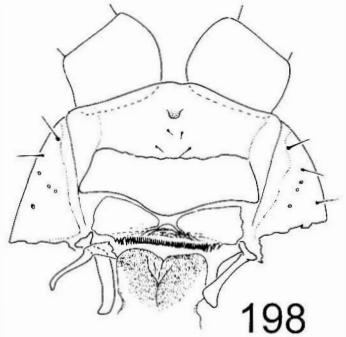
Figs. 184-197:

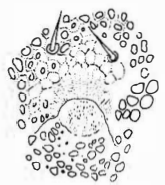
Macronicophilus abbreviatus n.sp., ♂ holotype, Brazil: Amazonas: 02°30'S 60°10'W.

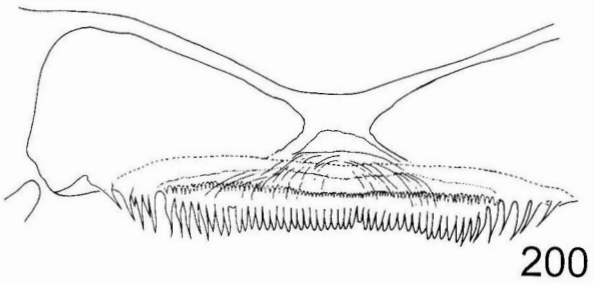
184-190: sterna I, II, XIV, XVII, XXVIII, XXXV, XXXVIII; **191**: last leg-bearing segment and terminal segments, d.; **192**: the same, v.; **193**: detail of praetarsus of last r. leg, v.; **194**: terminal segments, v.; **195**: penis, d.

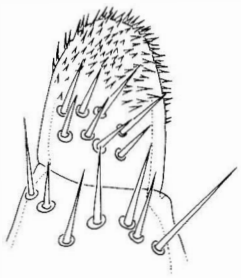
Macronicophilus abbreviatus n.sp., ♀ allotype, Brazil: Amazonas: 02°30'S 60°10'W.

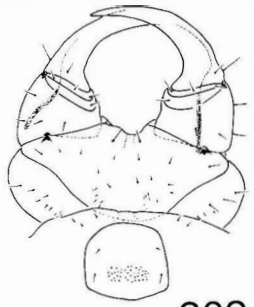
196: last leg-bearing segment and terminal segments, d.; **197**: the same, v.

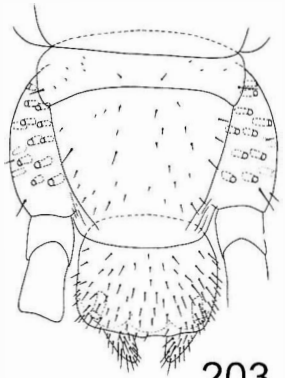


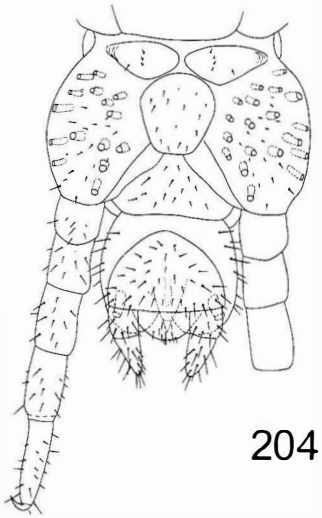








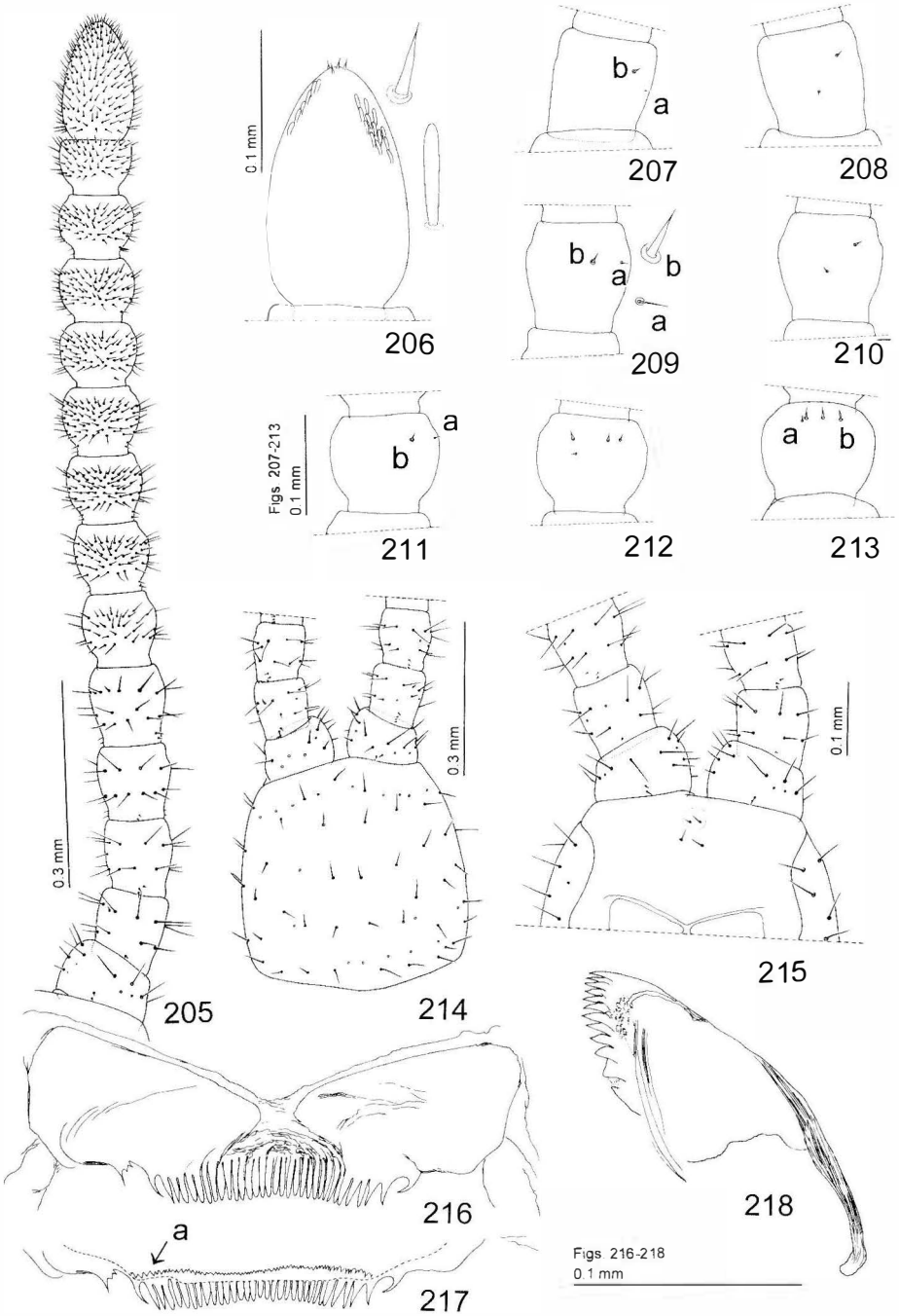




Figs. 198-204:

Macronicophilus ortonedae Silvestri, 1909, ♂, Colombia: Cafetal Camelia, close to Angelopolis, 1820 m a.s.l.

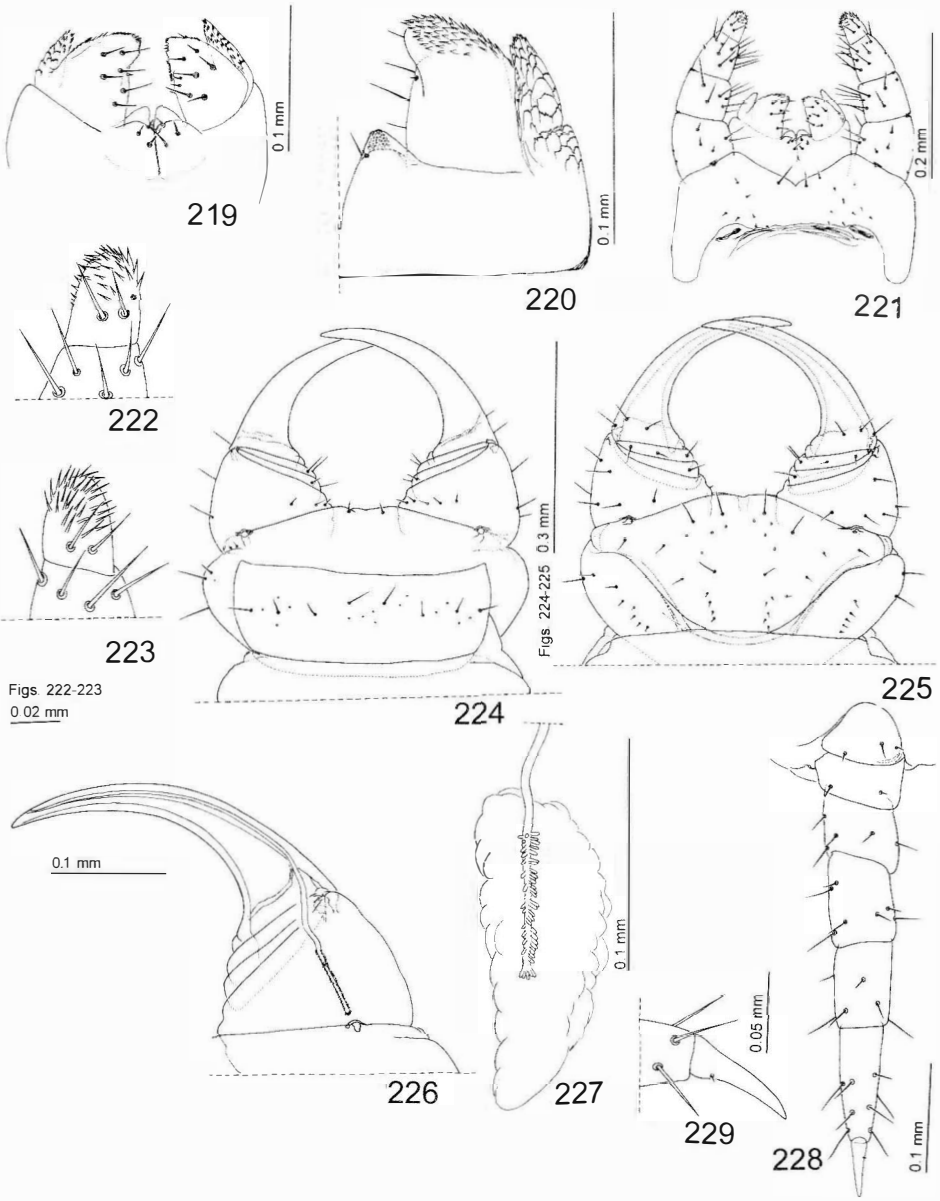
198: anterior half of head capsule and basis of antennae, v.; **199**: clypeal area ; **200**: labrum; **201**: apex of telopodite of second maxilla; **202**: forcipular segment with poison claws, v.; **203**: last leg-bearing segment and terminal segments, d.; **204**: the same, v. (all from RIBAUT, 1912).



Figs. 205-218:

Macronicophilus unguiseta n.sp., ♂ holotype, Brazil: Amazonas: Rio Tarumã Mirim.

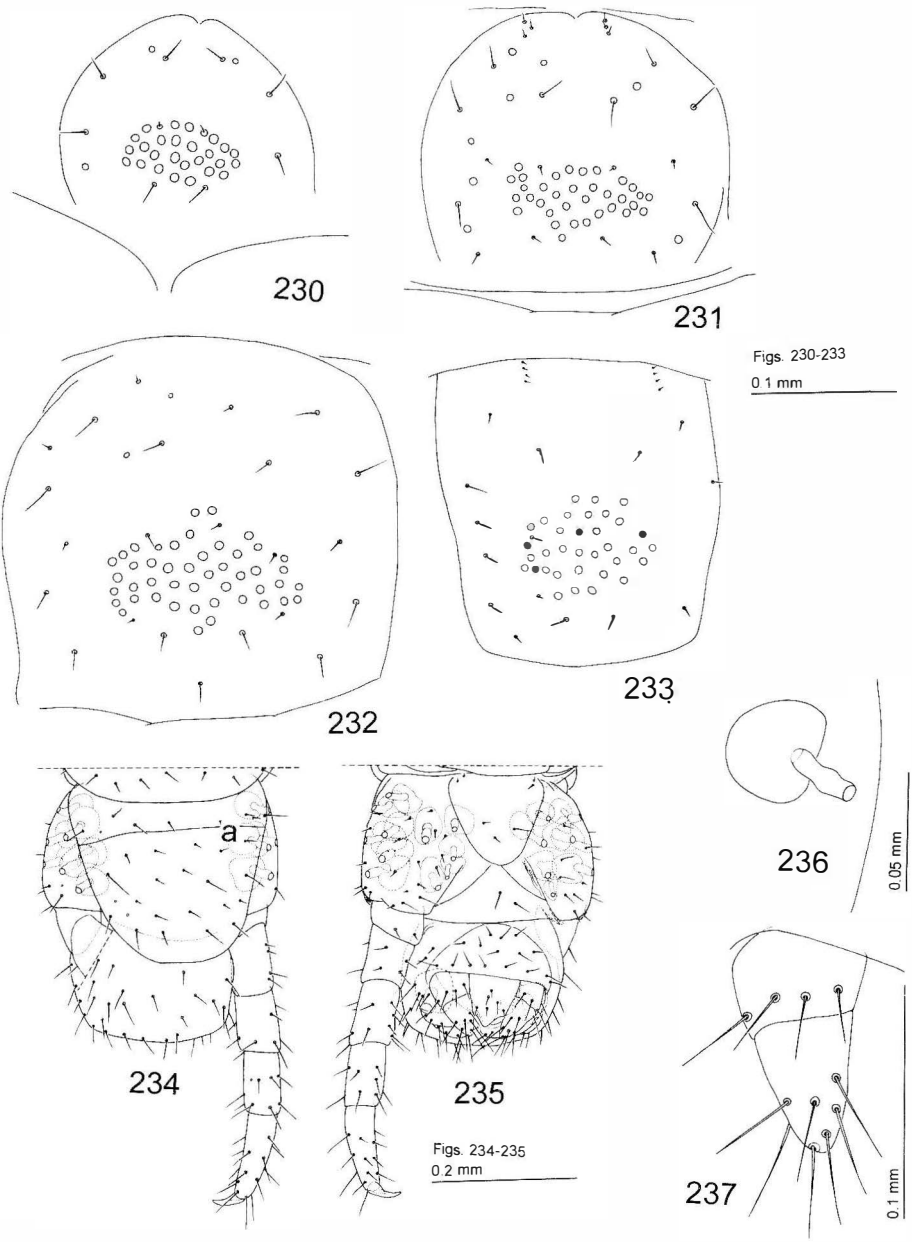
205: l. antenna, v.; **206**: l. a.a. XIV, d., with enlarged detail of one of the apical hyaline sensilla and one of the lateral claviform sensilla; **207**: r. a.a. II, v.; **208**: r. a.a. II, d.; **209**: r. a.a. V, v. (*a*, *b*, the two types of sensilla occurring on some antennal articles: details at higher magnification); **210**: r. a.a. V, d.; **211**: r. a.a. IX, v.; **212**: r. a.a. IX, d.; **213**: r. a.a. XIII, d.; **214**: cephalic shield; **215**: clypeus and basis of antennae; **216**: labrum; **217**: detail of dorsal (internal) teeth of labrum (*a*); **218**: r. mandible.



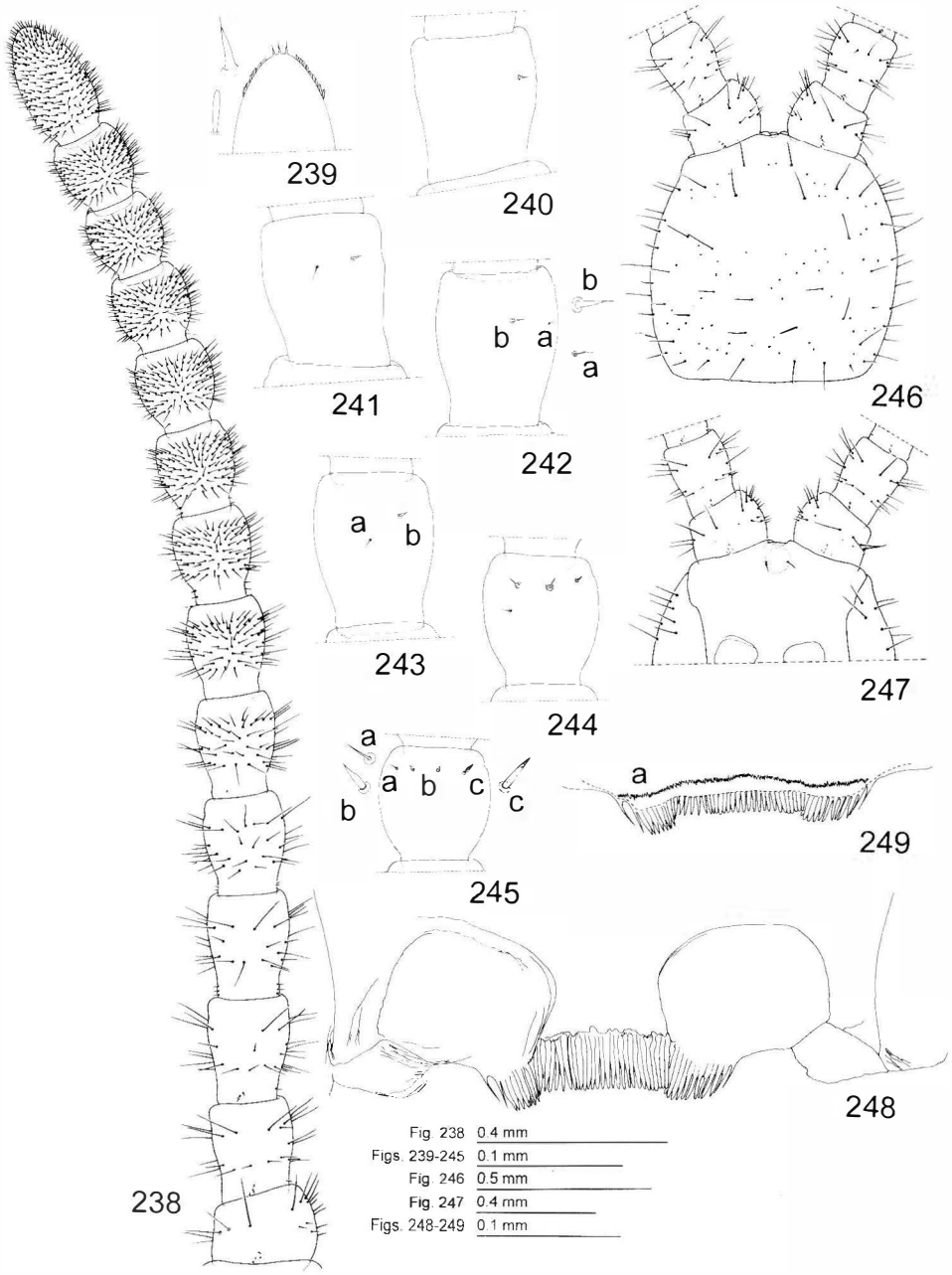
Figs. 219-229:

Macronicophilus unguiseta n.sp., ♂ holotype, Brazil: Amazonas: Rio Tarumã Mirim.

219: first maxillae, v.; **220**: r. first maxilla, d.; **221**: first and second maxillae, v.; **222**: detail of distal end of telopodite of l. second maxilla, v.; **223**: the same, d.; **224**: forcipular segment with poison claws, d.; **225**: the same, v.; **226**: detail of poison gland in r. poison claw, d.; **227**: detail of r. poison gland, d.; **228**: r. leg XXXI, v.; **229**: claw of r. leg X, latero-posterior view.



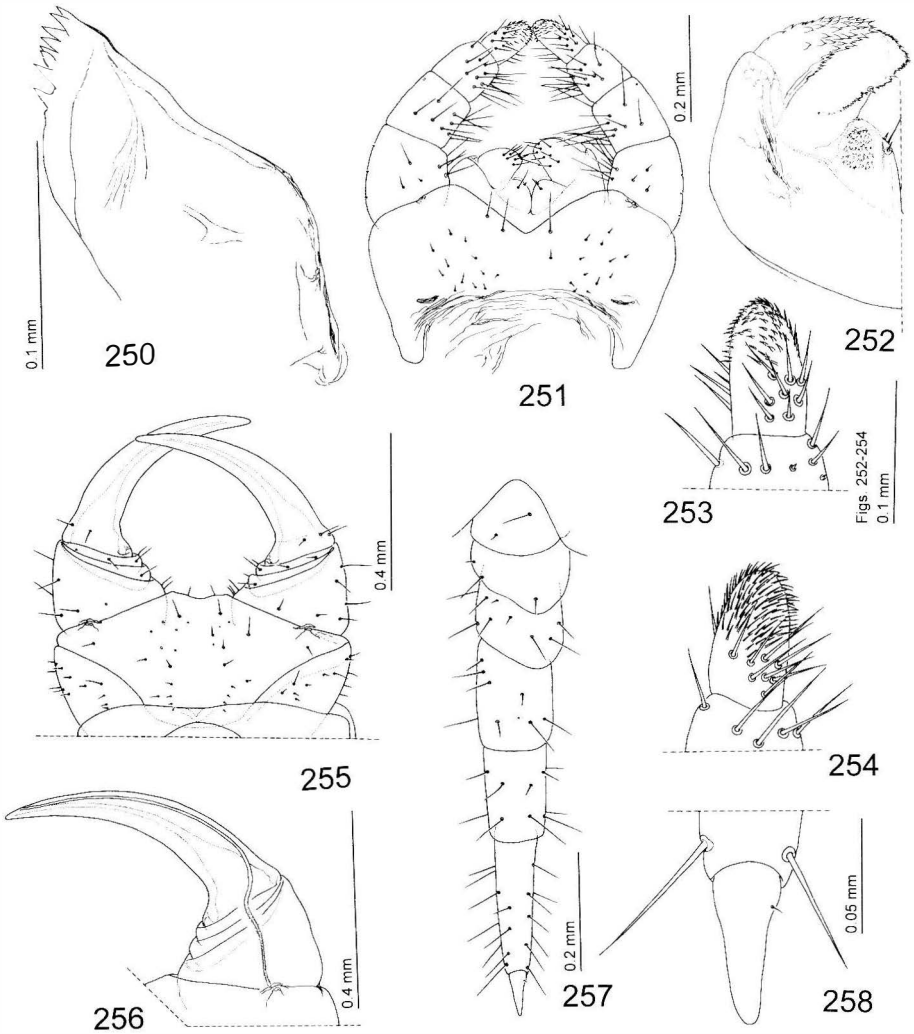
Figs. 230-237:
Macronicophilus unguiseta n.sp., ♂ holotype, Brazil: Amazonas: Rio Tarumã Mirím.
230-233: sterna I, II, X, LII; **234**: last leg-bearing segment and terminal segments, d. (a, coxal organ); **235**: the same, v.; **236**: detail of coxal organ marked as *a* on Fig. 234; **237**: r. gonopod, v.



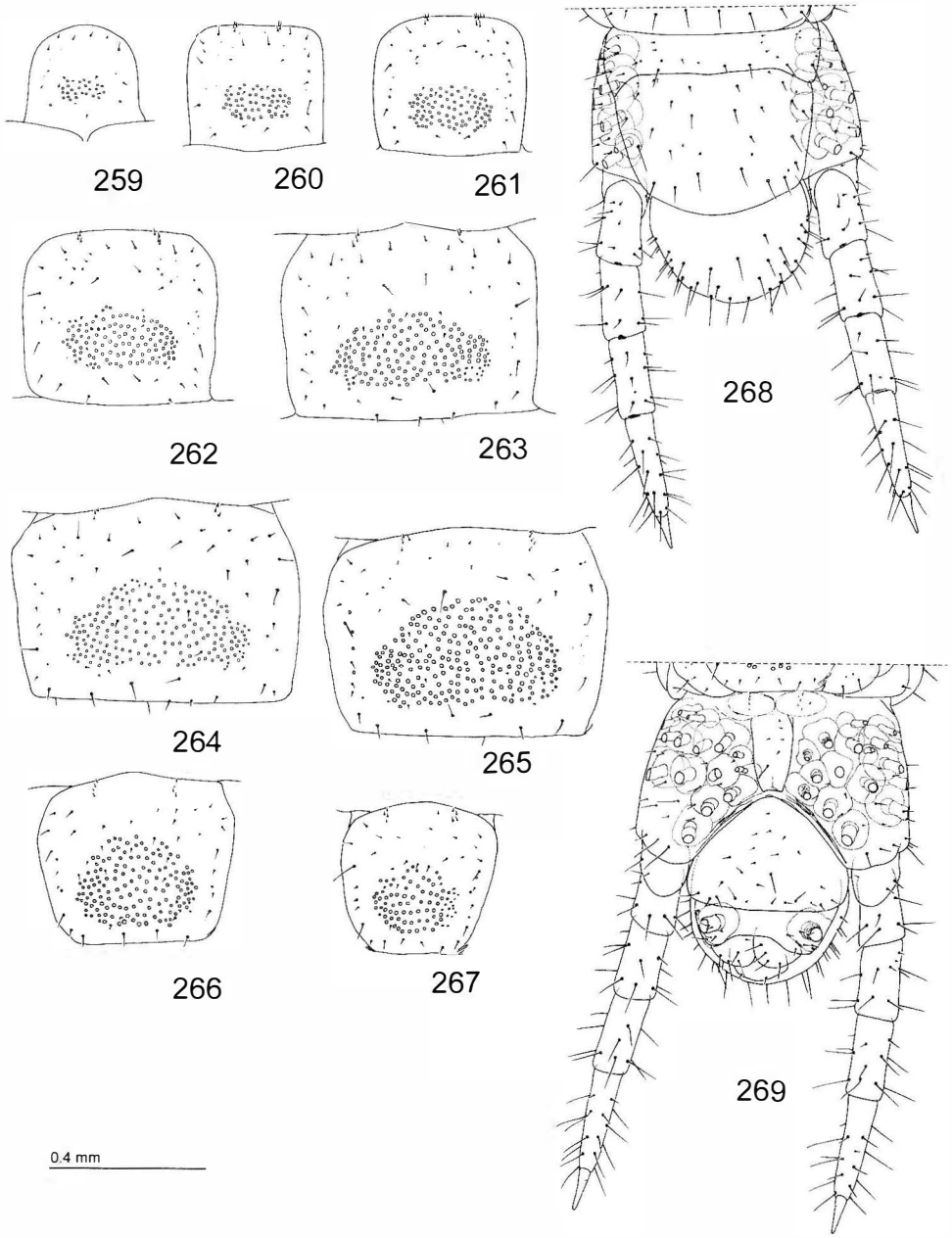
Figs. 238-249:

Macronicophilus venezolanus n.sp., ♀ holotype, Venezuela: Bocono: Guaramacal.

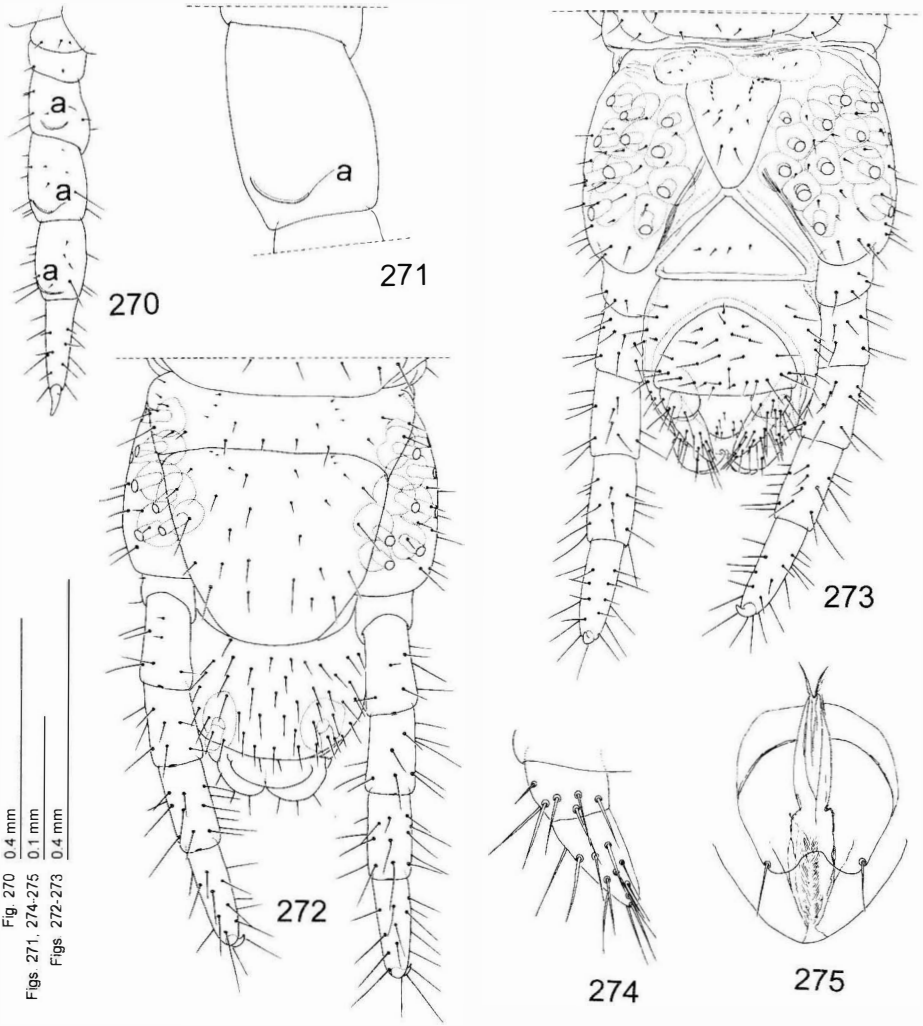
238: r. antenna, v.; **239**: r. a.a. XIV, v., with enlarged detail of one of the apical hyaline sensilla and one of the lateral claviform sensilla; **240**: r. a.a. II, v.; **241**: r. a.a. II, d.; **242**: r. a.a. V, v.; **243**: r. a.a. V, d.; **244**: r. a.a. IX, d.; **245**: r. a.a. XIII, d.; **246**: cephalic shield; **247**: clypeus and basis of antennae; **248**: labrum; **249**: detail of dorsal (internal) teeth of labrum (*a*).



Figs. 250-258:
Macronicophilus venezolanus n.sp., ♀ holotype, Venezuela: Bocono: Guaramacal.
250: l. mandible; **251**: first and second maxillae, v.; **252**: l. maxilla, d.; **253**: detail of distal end of telopodite of l. second maxilla, v.; **254**: the same, d.; **255**: forcipular segment with poison claws, v.; **256**: detail of poison gland in l. poison claw, v.; **257**: r. leg XVIII, v.; **258**: claw of r. leg XVIII, v.



Figs. 259-269:
Macronicophilus venezolanus n.sp., ♀ holotype, Venezuela: Bocono: Guaramacal.
259-267: sterna I, II, III, VII, XVII, XXVII, XLVI, LIII, LIV; **268**: last leg-bearing segment and terminal segments, d.; **269**: the same, v.



Figs. 270-275:
Macronicophilus venezolanus n.sp., ♂ allotype, Venezuela: Aragua: Rancho Grande, 1200 m a.s.l.
270: r. leg **L1**, v. (*a*: projection with round tip); **271**: detail of the projection marked as *a*; in Fig. 271; **272**: last leg-bearing segment and terminal segments, d.; **273**: the same, v.; **274**: r. gonopod, v.; **275**: penis, d.

	P. ascendens	*P. geayi*	*P. gaigei*	*P. ducalis*
body length	33 mm	31 mm	45 mm	52 mm
pairs of legs	♀ 43, 45, 47 ♂ 43, 45	♀ 51, (53), 55 ♂ 49, 51,53	♀ 55, 57 ♂ 53	♀ 65, 67, 69 ♂ 65, 67
small setae on antennal articles	VI to XIV	III to XIV	V-VI to XIV	VIII to XIV
teeth of lateral pieces of labrum	relatively small, subtriangular, with a sharp medial extension	relatively small, subtriangular, with a sharp medial extension	relatively small, subtriangular, with a sharp medial extension	long hyaline filaments; very different in shape, size and colour from those of the mid-piece
a tooth on the apical medial edge of forcipular trochanteropraefemur	no	yes	yes	yes
posterior limit of v. pore field series	sternum XXII-XXVI	antepenultimate sternum	antepenultimate sternum	penultimate sternum
pleurites at the side of praetergum of last leg-bearing segment	no	no	yes	yes
ratio of length of sternum of last leg-bearing segment to length of last legs	1:5.0-5.5	1:5.6-5.7	1:7.0-7.2	1:5.2-5.5

Table 1: Diagnostic characters for some Neotropical species of *Pectiniunguis*.

Table 2: Diagnostic characters for the species of *Hyphydrophilus*.

	H. adisi	*H. projectus* n.sp.
body length	♀ 18 mm ♂ 16 mm	♀ 10 mm ♂ 10 mm
pairs of legs	♀ 39, (41), 43 ♂ 41	♀ 37, (39), 41 ♂ 37, 39, 41
teeth of the mid-piece of labrum	all teeth of the same length	2+2 marginal teeth much longer than the many intermediate ones
teeth of the lateral pieces of labrum	on the medial half; teeth as long as the labral mid-piece	on the medial third only; teeth twice as long as the depth of the labral mid-piece
distoectal process on articles I and II of II maxillae telopodite	absent	present
ventral pore fields in the posterior half of the trunk	divided in two areas	undivided
sternum of last leg-bearing segment	posterior third thickly hirsute	with only two rows of posterior setae (♂, Fig. 138; ♀, Fig. 140)
anal organs	present	absent

	R. ducalis	*R. onycophaena*	*R. rossi*	*R. tropica*
body length	14	13	22	14
pairs of legs	♀ 41, 43 ♂ 41	♀ 41 ♂ 39	sex unknown: 47	♀ 47 ♂ ?
surface of clypeal area	very densely reticulated	very densely reticulated	very densely reticulated	not reticulated, hyaline and finely grained
chitinous lines	complete	incomplete	?	incomplete
apic I internal edge of forcipular trochanteropraefemur	with a poorly pigmented tooth	with a small unpigmented projection	with a small conical black tooth	with a well developed and deeply pigmented tooth
forcipular tarsungulum basally	with a poorly pigmented small blunt projection	with a poorly pigmented denticle	with a well developed acute dark teeth	with a well developed dark teeth
ventral pore fields series along the whole trunk length	yes	yes	no: on anterior sterna only	yes
pore fields at midbody length divided in two areas	yes	yes	no (all pores undivided)	yes
number of coxal organs	3+3	2+2 or 3+3	3+3	ca. 5+6
last leg praetarsus	tubercle-like	unguiform	unguiform?	unguiform

Table 3: Diagnostic characters for some Neotropical species of *Ribautia*.

	M. abbreviatus n.sp.	*M. ortonedae* SILVESTRI	*M. unguiseta* n.sp.	*M. venezolanus* n.sp.
body length	♀ 16 mm ♂ 16 mm	♀ 37 mm ♂ 27 mm	♀ unknown ♂ 18 mm	♀ 32 mm ♂ 20 mm
pairs of legs	♀ 41 ♂ 39	♀ 59 ♂ 57, 61	♀ unknown ♂ 53	♀ 55 ♂ 53
type *c* sensilla on d. side of a.a. IX and XIII	yes	?	no	yes
clypeal surface	wholly reticulate, not sclerotized (Fig. 172)	posterior half not reticulate and strongly sclerotized (Fig. 198)	wholly reticulate, not sclerotized (Fig. 215)	wholly reticulate, not sclerotized (Fig. 247)
clypeal area	on a small round prominence; surface granular (Fig. 173)	on a raised prominence; surface granular (Fig. 199)	not on a raised prominence; surface finely reticulate (Fig. 215)	not on a raised prominence; surface finely reticulate (Fig. 247)
labral teeth	ca. 32 (Fig. 174)	ca. 60 (Fig. 200)	ca. 36 (Fig. 216)	ca. 52 (Fig. 248)
unreticulated area of labrum side-pieces	as in Fig. 174	as in Fig. 200	as in Fig. 216	as in Fig. 248
apical telopodite article of II maxillae	as in Fig. 178 (length/width ratio 1.8:1)	as in Fig. 201 (length/width ratio 1.25:1)	as in Figs. 222-223 (length/width ratio 1.37:1)	as in Figs. 253-254 (length/width ratio 1.8:1)
v. setae of apical telopodite article of II maxillae	ca. 3 (Fig. 178)	ca. 8 (Fig. 201)	ca. 2 (Fig. 222)	ca. 6-8 (Fig. 253)
forcipular tarsungulum	as in Figs. 180-181	as in Fig. 202	as in Figs. 224-226	as in Figs. 255-256
♂: last leg-bearing segment and terminal segments	as in Figs. 191-192	as in Figs. 203-204	as in Figs. 234-235	as in Figs. 272-273

Table 4: Diagnostic characters for the species of *Macronicophilus*.